ISIS SONAR®

User's Manual, Volume 2
Appendices

Software documentation through v6.6

June 2004

Copyright Notice

This software is copyrighted and licensed for use on one computer per copy. Triton Elics International grants permission to the purchaser to make a limited number of copies of the program for backup purposes. Additional reproduction of the programs or this manual is a violation of the copyright law.
The licensee is bound by the terms and conditions set forth in the Software License Agreement and Limited Warranty that accompanies this document.

BathyPro™, Isis® Sonar Pipeline, DelphSeismic®, DelphMap®, Survey Office™, Hydro Suite™, TriPort™, Q-MIPS™, VISTA™, TriCAS™, ROVFlight™, A-B™, and Convert CD™, are trademarks of Triton Elics International, Inc.;

Isis® Sonar is a registered trademark of Triton Elics International, Inc.

The following are copyrights of their respective companies or organizations:

- WinRT Registry: BlueWater Systems
- HawkEye, Imagine 128: Number Nine Visual Technology Corp.

The following are trademarks and/or registered trademarks of their respective companies or organizations:

- EXB-8500, EXB-8505XLI, EXB-8500C, EXB-8205: EXABYTE Corporation
- Windows, Windows NT, Windows 95, MS-DOS: Microsoft Corporation
- Pentium, MMX: Intel Corporation
- Adaptec AHA 1505 and AHA 2940: Adaptec, Inc.
- Klein 5000, Klein 2000, Klein 595: Klein Associates, Inc.
- DF-1000: EdgeTech
- Echoscan, Echotrac: Odom Hydrographic Systems, Inc.
- ADS-640, GSP-1086, EPC-9082: EPC Labs, Inc.
- Sentinel Scribe: Rainbow Technologies North America, Inc.
- mach64: ATI Technologies, Inc.
- HYPACK: Coastal Oceanographics, Inc.
- International Business Machines
- 1200C, DesignJet 650C: Hewlett-Packard
- 1086, 8300, 980x plotters: EPC
- TDU 1200, 850, 2000 plotters: Raytheon
- 195 (same as Dowty 195, Ultra 195 and Ultra 200): Waverley
- InstallShield: InstallShield Corporation

All other brand or product names mentioned in this manual are trademarks or registered trademarks of their respective companies or organizations.

Safety Precautions

Please adhere to the hardware and software precautions mentioned below. In addition, observe all safety precautions mentioned in this manual.

When working with the overall system

1. Before handling components inside your computer system, exit all applications and shut down the operating system in accordance with procedures applicable to them.
2. Turn off the power to the computer and disconnect all cables that may be feeding electrical power to the system you will be working on.
3. Wear a grounded, anti-static wrist-strap. This is especially important if you are removing, replacing, or installing a printed circuit board of any kind.

Failure to adhere to these and other safety precautions mentioned in the manual could result in harm to property or personnel!

When working with magneto-optical cartridge disks

- Please refer to the Appendix entitled “Mass Storage Options” for important details covering the handling of M-O disks!
- Never boot your system with a writable M-O cartridge inserted into the drive!
- Use magneto-optical media that has 512 bytes per sector, not 1024 bytes per sector, and use the AFDisk software utility to format magneto-optical media. Never use Windows 95 to format M-O media!

Triton Elics Internatonal
125 Westridge Drive
Watsonville, CA 95076
USA

© 1991-2004 Triton Elics International, Inc. All rights reserved. Printed in the U.S.A.

SOFTWARE LICENSE AGREEMENT

By opening this package, you agree to be bound by the terms of this Agreement, which include the software license and the limited warranty. This Agreement applies to you and any subsequent licensee of this software program. If you do not accept or agree to the terms of this Agreement, do not open this sealed package. Promptly return the unopened package to TRITON ELICS for a refund. However, no refund or replacement will be given if the sealed envelope containing the SOFTWARE Sentinel and Manual has been opened or if any of the components of the product (including the software sentinel) are missing. Grant of license for the software product and full title and ownership of the hardware product shall not transfer to the Buyer until the purchase price, plus any interest or fees resulting from late payments or pre-arranged terms, has been received in full by the Seller.

1. GRANT OF LICENSE: TRITON ELICS grants you the right to use the enclosed TRITON ELICS software product in the manner provided below.

YOU MAY:

- Use one copy of the TRITON ELICS software products identified above on a single computer.
- Make one (1) copy of the program in machine-readable form solely for backup purposes, provided that you reproduce all proprietary notices.
- Transfer the SOFTWARE and user documentation on a permanent basis provided you retain no copies and the recipient agrees to the terms of this Agreement.

YOU MAY NOT:

1. Reverse engineer, decompile, modify or disassemble the SOFTWARE except to the extent such foregoing restriction is expressly prohibited by applicable law. Remove any proprietary notices, labels, or marks on the program, documentation, or program disk.

2. UPGRADES. SOFTWARE and documentation upgrades are provided free of charge for one year from the date of shipment. If the SOFTWARE is an upgrade, you may use or transfer the SOFTWARE only in conjunction with upgraded product. You may use that upgraded product only in accordance with this License.

3. COPYRIGHT. The SOFTWARE (including any images, “applets,” animations, video, audio, music, and text incorporated into the SOFTWARE) is owned by TRITON ELICS and is protected by United States copyright laws and international treaty provisions.

4. TECHNICAL SUPPORT. Technical Support is available by phone, fax, modem, Triton Elics bulletin board service or Internet free of charge during warranty period. MARISAT charges are invoiced at cost plus twenty percent.

5. EXPORT RESTRICTIONS. You agree that neither you nor your customers intends to or will, directly or indirectly, export or transmit the SOFTWARE or related documentation and technical data to any country to which such export or transmission is restricted by any applicable U.S. regulation or statute, without the prior written consent, if required, of the Bureau of Export Administration of the U.S. Department of Commerce, or such other governmental entity as may have jurisdiction over such export or transmission.

LIMITED WARRANTY

TRITON ELICS warrants that (a) the SOFTWARE will perform substantially in accordance with the accompanying written materials for a period of one (1) year from the date of shipment and (b) any hardware accompanying the SOFTWARE will be free from defects in materials and workmanship under normal use and service for a period of one (1) year from date of shipment.

CUSTOMER REMEDIES. TRITON ELICS's entire liability and your exclusive remedy shall be, at TRITON ELICS's option, repair or replacement of the SOFTWARE or hardware that does not meet TRITON ELICS's Limited Warranty. Warranty service is F.O.B. TRITON ELICS's Watsonville facility. All shipping and insurance costs are paid by buyer. On-site Customer Service and Warranty Repair (including travel hours, transportation, lodging and meals) may be provided by TRITON ELICS, at its own discretion, to Buyer at cost plus twenty percent. However, actual labor hours to provide this service or repair will be free of charge to Buyer. This Limited Warranty is void if failure of the SOFTWARE or hardware has resulted from accident, abuse, or misapplication. Any replacement SOFTWARE or hardware will be warranted for the remainder of the original warranty period or thirty (30) days, whichever is longer.

NO OTHER WARRANTIES. Except for the above express limited warranties, TRITON ELICS makes no warranties, expressed, implied, statutory, or in any communication with you, and TRITON ELICS specifically disclaims any implied warranty of merchantability or fitness for a particular purpose. TRITON ELICS does not warrant that the operation of the program will be uninterrupted or error free. Some states/jurisdictions do not allow the exclusion of implied warranties, so the above exclusions may not apply to you. This limited warranty gives you specific legal rights. You may have others, which vary from state/jurisdiction to state/jurisdiction.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES. To the maximum extent permitted by applicable law, in no event shall TRITON ELICS be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use this TRITON ELICS product, even if TRITON ELICS has been advised of the possibility of such damages. Because some states/ jurisdictions do not allow the exclusion or limitation of liability for consequential or incidental damages, the above limitation may not apply to you.

U.S. GOVERNMENT RESTRICTED RIGHTS. The SOFTWARE and documentation are provided with RESTRICTED RIGHTS. Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph (c) (1) and (ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 or subparagraphs (c) (1) and (2) of the Commercial Computer Software—Restricted Rights at 48 CFR 52.227-19, as applicable. Manufacturer is Triton Elics International, Inc., 125 Westridge Drive, Watsonville, CA 95076. If you acquired this product in the United States, this Agreement is governed by the laws of California. If this product was acquired outside the United States, then local law may apply.

TRITON ELICS INTERNATIONAL SOFTWARE LICENSE AGREEMENT AND LIMITED WARRANTY

Preface Using This Manual

This book is the second part of a two-part set from Triton Elics International, Inc.: ***Isis User's Manual, Volume 2.*** It contains supplementary information, such as file format structure, navigation templates, and other infrequently accessed Isis information. ***Isis User's Manual, Volume 1,*** contains most of the most frequently accessed functions and information relevant to the software. ***Isis User's Manual, Volume 2,*** complements Volume 1.

Throughout this manual, warnings, hints and important statements are separated from the text, ***italicized*** and denoted by the following symbols.

Denotes a warning or caution.

Denotes an important statement, tip, or hint.

Skills You'll Need to Know Before Using Isis

To use Isis, you should know basic Windows concepts, such as working with icons on the Windows desktop. You can find this information in the Microsoft on-line Help system built into the Windows systems.

Finally, you should already be comfortable using the basics of Isis before delving into Volume 2.

APPENDIX A Q-MIPS FILE FORMAT **1**
A.1 GENERAL DESCRIPTION 1
A.2 HEADER AND FOOTER DATA 1
A.3 IMAGERY DATA 2
A.3.1 Eight-Bit Data 2
A.3.2 Sixteen-Bit Data 2
A.4 BINARY DATA REPRESENTATION 5

APPENDIX B ISIS BAC AND GAC FILE FORMATS **23**
B.1 BAC FILE FORMAT 23
B.2 GAC FILE FORMAT 24

APPENDIX C MASS STORAGE OPTIONS **25**
C.1 SCSI BUS CONFIGURATION 25
C2 USING EXABYTE TAPE DRIVES WITH ISIS 26
C3 USING THE SEG-Y FORMAT ON EXABYTE TAPE 28
C4 USING MAGNETO-OPTICAL DRIVES WITH ISIS 29
C.4.1 Different Sector Sizes, Different Purposes 29
C.4.2 Typical HP Cartridge Types 30
C.4.3.1 Backing Up Your M-O Data Before Reformatting 31
C.4.3.2 Formatting the M-O after Backing up Your M-O's Data 32
C.4.3.3 Restoring Your Backed Up Data after Reformatting 34
C.4.3.4 Restarting Windows 95 after Restoring Your M-O's Data 35

APPENDIX D SERIAL INTERFACES **36**
D.1 CONNECTION 36
D.2 RECEIVE DATA FORMAT 37

D.3 TEMPLATE CONSTRUCTION 38
D.3.1 Example of Template Construction 40
D.3.2 Values Allowed Over Serial Interfaces and Stored by Isis 41
D.3.2.1 Examples of Pattern Matching 46
D.3.2.2 Examples of Character Alignment 47
D.3.3 Performing Math on Template Tokens 47
D.3.4 Template Instructions That Do Not Evaluate to a Number 49
D.4 SPECIAL READY-MADE TEMPLATES THAT ISIS CAN USE 50
D.4.1 How Isis Works with NMEA0183 Strings 51
D.4.1.1 How Isis Deals With Heading Issues in NMEA0183 Strings 52
D.4.1.2 How Isis Deals With Time Issues in NMEA0183 Strings 52
D.4.1.3 Real-Time Kinematic 54
D.4.2 Disabling ASCII Reports Produced by NMEA Packets 55
D.5 SPECIAL SERIAL RECEIVE STRINGS 55
D.6 TRANSMIT DATA FORMAT 58
D.7 LOGGING AND TRANSMITTING TO A SERIAL PORT 60

APPENDIX E USING THE TARGET UTILITY 61
E.1 RUNNING TARGET 61
E.2 TARGET'S FILE MENU 62
E.2.1 Find 66
E.2.2 Print ASCII Report 69
E.3 TARGET'S EDIT MENU 71
E.4 CONTACT LOGGING 76
E.4.1 Contact Information 76
E.4.2 Contact Mensuration 78
E.5 THE ENHANCE FUNCTION 81

E.6 TARGET'S WINDOW MENU 93
E.6.1 Tile, Cascade, Arrange Icons, Close All 94
E.6.2 Reduce Image and Expand Image 94
E.6.3 Threshold 96
E.6.4 Pan Left, Right, Up or Down 96
E.7 FORMAT OF TGT AND CON FILES 96
E.7.1 WPOINT: A Structure for Bridging Back to 16-Bit Systems 97
E.7.2 CINFO: Channel Information Header Structure 97
E.7.3 The Image Structure 102
E.7.4 Telemetry Structure 102

APPENDIX F WORKING WITH SIGNAL INTERFACES 105
F.1 SIGNAL INTERFACE UNIT 5 (SIU5) 105
F.2 SIU4 AND SIU4-2 ANALOG INTERFACE 106
F.2.1 Mechanical Description 107
F.2.2 Theory of Operation 109
F.2.3 System Tests Using the SIU4-2 111

APPENDIX G HOW ISIS PROCESSES CTD DATA 114
G.1 OVERVIEW 114
G.2 HOW ISIS TREATS SEABIRD CTD DATA 115
G.3 HOW ISIS TREATS FALMOUTH SCIENTIFIC CTD DATA 117

APPENDIX H USING A SEATEX MRU WITH ISIS 120
H.1 SETTING UP THE MRU 120
H.2 SETTING UP ISIS TO WORK WITH THE MRU 120
H.3 SAVING MRU DATA IN ISIS 120
H.4 IF THE MRU HAS A ONE-WAY SERIAL CONNECTION 123

APPENDIX I WORKING WITH SPECIFIC SONARS 124
I.1 EDGETECH DF1000 DIGITAL SONARS 127
I.1.1 Summary Description of an EdgeTech ACI Board 130
I.1.2 EdgeTech DF1000 Usage Notes 130
I.2 KLEIN ANALOG SONAR SYSTEM 131
I.3 KLEIN DIGITAL SONAR SYSTEM 2000 132
I.3.1 Hardware Setup 132
I.4 KLEIN DIGITAL SONAR SYSTEM 3000 133
I.4.1 Starting the Klein 3000 TPU 133
I.4.2 Configuring Isis for Klein 3000 133
1.4.2.1 'More Options' in Isis Server for Klein 3000 dialog box 135
I.5 KLEIN DIGITAL SONAR SYSTEM 5000 138
I.5.1 Starting the Klein 5000 TPU 138
I.5.2 Configuring Isis for Klein 5000 138
I.5.2.1 'More Options' in Isis Server for Klein 5000 dialog box 141
I.5.2.1.1 Log Data in Isis Panel 142
I.5.2.1.2 Miscellaneous Fields in 'More Options' 144
I.5.2.2 Some Guidelines for Speed, Range and Resolution 144
I.5.2.3 'Advanced Setup and Diagnostics' in Server for Klein5000144
I.5.2.3.1 Advanced Settings 145
I.5.2.3.2 Compute Depth from Voltage Panel 147
I.5.2.3.3 Diagnostics Panel 147
I.6 RESON SEABAT 81XX SONAR 147
I.7 SIMRAD 992 SONAR 157

Appendix A Q-MIPS File Format

Isis and VISTA support a number of file formats: Q-MIPS, BAC, GAC, and XTF. Each has distinct advantages. This appendix explains the structure and use of the Q-MIPS format.

A.1 General Description

The Q-MIPS file format is perhaps the mostly widely known and used file format for VIS_TA and other applications capable of displaying sidescan data imagery. Q-MIPS-style data files are stored in binary format. Each data file consists of a 1024-byte file header followed by ping records. Each ping record consists of a number of imagery channels followed by a 256-byte footer record.
The following format description is current for Q-MIPS version 6.69, Q-MIPS/DSP version 1.16 and Isis . Both Isis and TrakMap use this same data format. Q-MIPS and Q-MIPS/DSP are limited to four sonar channels and eight imagery channels at 1024 pixels per channel (four raw, four corrected).
Table A-5 on page 9 and Table A-6 on page 16 describe each field in the header and footer structures respectively. For specific C-language header and footer structures used by Q-MIPS (and Q-MIPS/DSP) and Isis, refer to **UPDATES.DOC** and **QMIPSFMT.H** respectively. These files are included with every software release.

A.2 Header and Footer Data

For Q-MIPS systems, you can set some of the values in the header and footer in the configurable files called **QMIPS.DAT** and **SONAR.DAT**. Refer to Appendix A of the Q-MIPS User's Manual for descriptions of these files. Isis relies on setup configurations saved in the binary ISIS.CFG file for many of these values. You can change many of the startup defaults loaded from the QMIPS.DAT, SONARS.DAT and ISIS.CFG files without quitting and re-starting the Q-MIPS or Isis program. Generally, display-related parameters can be changed on-the-fly during collection. The current destination file must be closed before changing most acquisition- and storage-related parameters from the menus.

Many other values are controlled by strings received over RS-232 serial interfaces from the navigation system and/or any serial device. Refer to Appendix E of the *Q-MIPS User's Manual* or ***'Serial Interfaces' (Appendix D)*** of this manual for descriptions of the values that can be set in this manner. Navigation telemetry values are replicated in their respective fields from ping to ping until a new navigation string is received at the serial port. Then the values present in the string are used to update the appropriate fields in the footer. If desired, the Q-MIPS or Isis system time can be synchronized to the time indicated in the telemetry string.
All binary data are stored according to the Intel representation scheme. This is an important distinction if you plan to read or write Q-MIPS-style data using Motorola-based, MIPS-based, or SPARC-based platforms.

A.3 Imagery Data

Regardless of how many samples are collected per channel per ping, the data are decimated (or replicated) to be stored at 1024 pixels per channel per ping by Q-MIPS or the user-specified number of pings by Isis. For a discussion of available decimation methods, refer to the description of the **ch1_sampleScheme** field under the heading Channel 1 Sonar Parameters in Table A-6 on page 16.
Isis can save both 8-bit and 16-bit data in Q-MIPS format.

A.3.1 Eight-Bit Data

Each sample is an unsigned 8-bit value with a range of 0-255. Assuming that the DSP card in Isis still has a factory jumper-setting configuration, the input range is 5 volts. During the conversion from 16-bit to 8-bit, the sign bit is omitted. So 0-255 represents a voltage range of 0 5 volts or 0 -5 volts depending on the original input signal. Note that for side-scan, the important quality to log is the ***magnitude*** of the signal from zero, not the actual signed voltage.

A.3.2 Sixteen-Bit Data

The A/D converter on the Isis DSP card samples at 18 bits, with the 16 most significant bits being available for storage. With 16 bits being saved, the entire sample is logged. Each sample is a signed value.

16 bits represent -32768 to +32767. This corresponds to an input voltage range of -5 to +5 volts. To convert a sample from the Q-MIPS file, use the following formula:

volts = (sample / 32768) x 5

Equation A-1. Formula for converting a Q-MIPS sample to 16-bit format

Note that the actual range is actually -5 volts to +4.9998 volts.

Each pixel of imagery will require either one or two bytes of disk storage depending on whether the data are saved at 8 or 16 bits per pixel. The number of bits per pixel is specified for Q-MIPS in the QMIPS.DAT file and for Isis using the **Record Setup** command.

Isis and Q-MIPS can store imagery in any combination of raw and corrected for each of up to four analog channels. A corrected channel has had the water column removed and has been slant-range corrected so that the displayed waterfall record approximates a “map-view” of the data.

If both raw and corrected data are saved by Isis or Q-MIPS, 1024 raw pixels are saved followed by 1024 corrected pixels for each channel. All specified types for channel 1 (raw and/or corrected) are saved first. Then all types for channel 2 and so on. The complete order for up to the Q-MIPS maximum of eight imagery channels is shown below. Remember, when a channel is not present or a data type (raw or corrected) is not to be saved, it is omitted. That is, no padding is done. Fewer imagery channels results in fewer bytes stored per ping.

Table A-1. Relationship in Q-MIPS of channel to data type to location

Channel	Data Type	Read or Write	Location
CH1	RAW	Write only	Port
CH1	CORRECTED	Write or Read	Port
CH2	RAW	Write only	Starboard
CH2	CORRECTED	Write or Read	Starboard
CH3	RAW	Write only	Port or Subbottom
CH3	CORRECTED	Write or Read	Port or Subbottom
CH4	RAW	Write only	Starboard or Subbottom

CH4	CORRECTED	Write or Read	Starboard or Subbottom

Port channels are stored in pixel order (reverse chronological order) from far range to nadir and starboard channels are stored from nadir to far range (chronological order). This convention matches the left-to-right orientation for the waterfall display on the Q-MIPS high-resolution imagery display. The ping imagery data are followed by the footer for each ping.
Subbottom pings are normally received asynchronously with respect to side-scan pings, downsampled differently, and stored with the nearest side-scan ping. A subbottom channel is termed the asynchronous channel and must be received on the last (highest number) channel present. The asynchronous ping rate is generally slower than the side-scan ping rate so the data are replicated ping-by-ping until a new asynchronous ping is received.
When computing the size of Q-MIPS format files to estimate survey storage media requirements or throughput rates, use the equations shown in Equation A-2 on page 4 and Equation A-3 on page 4:
BPP = NIC x PPC x (BPX/8) + PFS in bytes

Equation A-2. Calculating bytes per ping
File Size = 1024 + (NP x BPP) in bytes

Equation A-3. Calculating file size using bytes per ping
where, in Equation A-3, the meaning of the variables are shown in:Table A-2
.

Table A-2. Variables for calculating bytes per ping

BPP	=	Bytes per ping
NIC	=	imagery channels being saved (raw and corrected)
NP	=	number of pings stored in file
PPC	=	pixels per channel per ping (always 1024 for Q-MIPS)
PFS	=	ping footer size = 256
BPX	=	bits per pixel (user-defined as 8 or 16)

For example, a data file written by Q-MIPS with 3 pings of raw and corrected imagery for each of two sidescan channels at eight bits per pixel would be configured as follows:

Table A-3. Sample configuration illustrating file size

Size of Data in Bytes	Description
[1024]	Q-MIPS Header
[1024] [1024] [1024] [1024] [256]	Ping 1, Four channels, 1024 bytes each; Q-MIPS footer
[1024] [1024] [1024] [1024] [256]	Ping 2
[1024] [1024] [1024] [1024] [256]	Ping 3

The amount of memory all the data would occupy is:

14080 bytes [(1024 x 13) + (256 x 3)]

A.4 Binary Data Representation

The Q-MIPS format header and footer structures are made up of fields in six number representation schemes or types. For each type shown in Table A-4 on page 6, the type definition from the C-language Q-MIPS source code is shown in parentheses and the range of numbers that can be represented by that type is shown in brackets.

Note: Q-MIPS and Isis will never store a 12-bit value in a 12-bit field. All sonar values are stored as 8 or 16 bit.

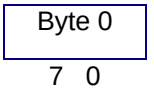
Table A-4. Data representation types for Q-MIPS headers and footers

Data Types	Type Definitions and Possible Range of Values
SHORT	signed, two's complement integer two bytes INT format [-32,768 to 32,767] or four bytes LONG [-2,147,483,648 to 2,147,483,647] format
USHORT	unsigned integer two bytes WORD format [0 to 65,535] or four bytes DWORD format [0 to 4,294,967,296]
FLOAT	floating point number in IEEE single precision standard four-byte format FLOAT format [10-38 to1038]
DOUBLE	IEEE double precision standard eight-byte DOUBLE format [10-308 to 10 308]
CHAR	signed character one byte CHAR format [-128 to 127]; can be interpreted by ASCII code or as an 8-bit signed integer
BYTE	unsigned character one byte BYTE format [0 to 255]; can be interpreted by ASCII code or as an 8-bit unsigned integer

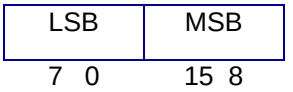
The exact byte and word ordering for each of these types and the IEEE floating point formats are described below. Any unused fields are filled with zeros, that is, each bit within the field will be a zero instead of a one. The integers will return the value **0**, the floating point numbers will return the value **0.0**, and the characters will return the value **0** or the null character **\0**, depending on how they are interpreted. In Table A-5 on page 9 and Table A-6 on page 16, which describe the complete header and footer formats, respectively, one column indicates the type for each field.

The Q-MIPS format data are stored according to the Intel processor scheme for representation of numbers in memory. This is described below. If a number is represented by *N* bytes from most significant (MSB, Byte *N*-1) to least significant (LSB, Byte 0), and *N* x 8 bits from bit *N* x 8 -1 (MSB) to bit 0 (LSB), the stored bytes are found in the order described below. The bits within each byte are always in order from most significant (bit 7) to least significant (bit 0). All Intel 80x86 chips are Little Endian.

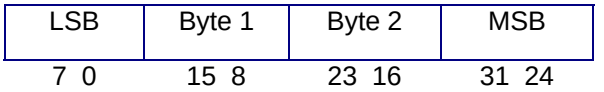
1-Byte Character



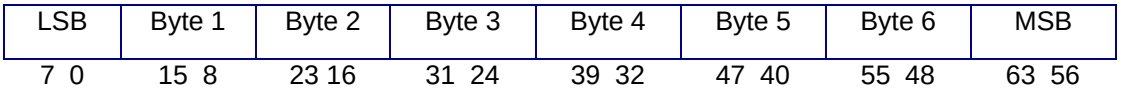
2-Byte Integer



4-Byte Number — Integer or Floating Point



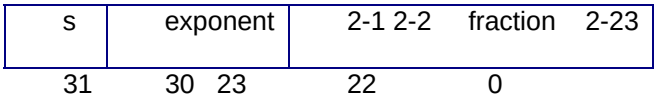
8-Byte Number — Integer or Floating Point



Integer numbers are organized exactly as above, where each bit has a unique significance equal to two raised to the power equal to the number of the bit position.

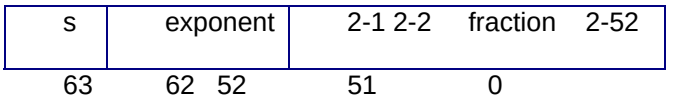
Floating point numbers are represented according to the IEEE Standard floating point formats described next. The formats are described in bit order from MSB to LSB. Remember that the bytes are “out of order” as described above according to the Intel processor number representation convention.

4-Byte IEEE Floating Point Number



value = (-1)s x 1.fraction x 2exponent - 127

8-Byte IEEE Floating Point Number



value = (-1)s x 1.fraction x 2exponent - 1023

Table A-5 on page 9 and Table A-6 on page 16 specify the formats for the Q-MIPS header and footer structures respectively. Character fields that contain more than one byte are arrays of characters interpreted as strings of text such as the name of the sonar or the software revision. In the Q-MIPS data format, only characters are arranged in arrays. The different sizes (in bytes) of the integer and float fields indicates their different precisions as described above. In order to save space and save you some reading time, two footnote symbols have been used to represent information common to many of the fields. The symbols are defined below and appear at the bottom of each of the tables.

† **Single dagger**: This field is for ***storage only*** and is not used in any Q-MIPS or Isis calculations.

* **Asterisk**: This field is set to the ***value received over the serial navigation interface*** (specified in navigation template) or among telemetry from various digital towfish. If a value is not received, the field remains zero.

Table A-5. Q-MIPS header format description

Offset	Element Name	Bytes Used	Value Type	Remarks, Values, Ranges, Units, Examples, etc.
Format and Revision				
0000	fileFormat	1	BYTE	50 for Q-MIPS files, 1 for old S-MIPS files.
0001	systemType	1	BYTE	0 is Q-MIPS, 84 is Q-MIPS/DSP, 202 is Isis.
0002	softwareRev	6	BYTE	Null-terminated string, e.g. “6.61\0” or “Isis” for Isis-recorded files.
0008	spare1	20	BYTE	Not currently used, all zeros.
Digitizer Parameters				
0028	sampleRate	2	USHORT	[0...750], Q-MIPS digitizing rate in ksamples/ second; not valid for Isis — set to 20.
0030	numImageryChannels	2	USHORT	[1...8], number of channels; up to 4 Q-MIPS channels, raw and/or processed; up to 4 Isis channels.
0032	bitsPerPixel	2	USHORT	[8 or 16], Q-MIPS analog data are limited by 12-bit resolution of A/D converter; Isis analog and all digital data can be 16-bit.
0034	pixelsPerChannelPerPing	2	USHORT	Always 1024 for files created by Q-MIPS; [0...65535] for Isis

0036	speedOfSoundInWater	4	FLOAT	Sound velocity divided by two in meters/sec loaded from QMIPS.DAT; specified with Isis Speed of Sound command; usually 750.
0040	noLongerUsed	4	FLOAT	Was initial sonar signal divisor in Q-MIPS version 5.19 and earlier. Not currently used, zeros.
0044	asyncChannelNumber	2	USHORT	[0...4] for Q-MIPS, 0 if no async channel. The async channel must be the last (highest number) channel collected; not used by Isis.
0046	numSonarChannels	2	USHORT	[1...4], number of analog sonar channels being digitized. In Q-MIPS, divide sample rate by this number to get the per-channel sampling rate.
0048	ch1_processingAvailable	2	USHORT	[0...3], indicates the presence of, and processing applied to, each of the four input channels: 0: not present; 1: raw only; 2: corrected only; 3: both raw and corrected.
0050	ch2_processingAvailable	2	USHORT	
0052	ch3_processingAvailable	2	USHORT	
0054	ch4_processingAvailable	2	USHORT	
Navigation System Parameters				
0056	navLatency[1]	2	USHORT	latency of navigation, in ms.

[1] Isis version 2.14 and later

0058	navSystemName	100	BYTE	Not currently used, all null chars (0). Prior to version 6.00, set to SERIAL_INPUT for serial port nav. Could also be QUILS II, SONARDYNE, or NOTHING in older versions.
0158	projectionType	12	BYTE	Not currently used, all null chars (0).
0170	spheriodType	2	BYTE	Not currently used, all null chars (0).
0182	zone	2	USHORT	Not used, all zeros (was UTM zone).
0184	originLat	4	FLOAT	Origin of the local coordinate system in decimal degrees for conversion from nav system.
0188	originLong	4	FLOAT	northings and eastings to Latitude and Longitude; not currently used, all zeros.
0192	offsetLat	4	FLOAT	Offset of the local coordinate system in meters from origin; not currently used; all zeros.
0196	offsetLong	4	FLOAT	
0200	navUnits	2	USHORT	[0...3], units for nav data, 0: meters, 1: feet, 2: yards, 3: degrees (Latitude & Longitude); feet and yards are not currently used.
Site Parameters				
0202	diveNumber	2	USHORT	All fields in this section are currently not in use. They
0204	blockNumber	2	USHORT	
0206	trackNumber	2	USHORT	

0208	runNumber	2	USHORT	are all set to 0.
0210	spare4[100]	100	BYTE	
Annotation				
0310	operatorAnnotation	100	BYTE	Not currently used, all null chars (0).
0410	sonarName	40	BYTE	Sonar name from SONARS.DAT for Q-MIPS; “Isis Analog Server” for Isis.
Sonar Parameters				
0450	triggerDirection	2	USHORT	Sonar trigger edge direction for Q-MIPS, 1: positive-going, 0: look for level, -1: negative-going, from SONARS.DAT or Record Mode set-up; not used by Isis.
0452	triggerMagnitude	4	USHORT	Sonar trigger threshold in A/D units (2.4mV) for Q-MIPS, from SONARS.DAT or Record Mode set-up; not used by Isis.
0456	triggerWidth	4	FLOAT	Duration of sonar trigger in seconds for Q-MIPS, from SONARS.DAT or Record Mode set-up; not used by Isis.
0460	ch1_frequency	2	USHORT	Sonar carrier frequency in kHz from SONARS.DAT for Q-MIPS; defaults to 100 for Isis. *
0462	ch2_frequency	2	USHORT	
0464	ch3_frequency	2	USHORT	
0466	ch4_frequency	2	USHORT	
0468	ch1_horizBeamAngle	4	FLOAT	Sonar 3dB narrow beam width in degrees from

0472	ch2_horizBeamAngle	4	FLOAT	width in degrees from SONARS.DAT. Used in mensuration and zoom display correction; not currently used by Isis.
0476	ch3_horizBeamAngle	4	FLOAT	
0480	ch4_horizBeamAngle	4	FLOAT	
Storage File Name				
0484	thisFileName[45]	45	CHAR	Original path name of current destination file.
0529	reserved2	1	CHAR	Unused, the null character (0).
More Sonar Parameters				
0530	ch1_halfWaveRectify	2	USHORT	Boolean, 1: channel is half-wave rectified, 0: this channel is not rectified; set to 0 for Isis.
0532	ch2_halfWaveRectify	2	USHORT	
0534	ch3_halfWaveRectify	2	USHORT	
0536	ch4_halfWaveRectify	2	USHORT	
0538	ch1_tiltAngle	4	FLOAT	Sonar transducer tilt angle down from horizontal in degrees, from SONARS.DAT. Used in beam angle compensation; defaults to 30 for Isis
0542	ch2_tiltAngle	4	FLOAT	
0546	ch3_tiltAngle	4	FLOAT	
0550	ch4_tiltAngle	4	FLOAT	
0554	ch1_beamWidth_3dB	4	FLOAT	Sonar 3dB fan (vertical) beam width in degrees from SONARS.DAT. Used in beam angle compensation; defaults to 50 for Isis
0558	ch2_beamWidth_3dB	4	FLOAT	
0562	ch3_beamWidth_3dB	4	FLOAT	
0566	ch4_beamWidth_3dB	4	FLOAT	
0570	ch1_realSampleRate	4	FLOAT	Used in DSP only.
0574	ch2_realSampleRate	4	FLOAT	
0578	ch3_realSampleRate	4	FLOAT	
0582	ch4_realSampleRate	4	FLOAT	

Reserved Space				
0586	spare5[438]	454	BYTE	Unused; all zeros.

†For storage only, not used in any Q-MIPS calculations.
*Set to the value received from navigation system or digital towfish; otherwise zero.

Table A-6. Q-MIPS footer format description

Offset	Element Name	Bytes Used	Value Type	Remarks, Values, Ranges, Units, Examples, etc.
Date and Time				
0000	day	1	BYTE	[1...31], day of the month.
0001	month	1	BYTE	[1...12], month of the year.
0002	year	1	BYTE	[0...99], year within the century.
0003	hour	1	BYTE	[0...23], hour of the day, 24-hour time.
0004	minute	1	BYTE	[0...59], minute within the hour.
0005	seconds	1	BYTE	[0...59], seconds within the minute.
0006	thousandsSeconds	2	USHORT	[0...999], thousandths of seconds. Time is kept by Q-MIPS or Isis system clock which can be synchronized to the nav system time at each nav fix (use AB in template).
Magnetometer Readings				
0008	magX	4	FLOAT	Magnetometer reading on x, y, and z axes,
0012	magY	4	FLOAT	units are not specified, the value provided by
0016	magZ	4	FLOAT	the telemetry is stored with no

				conversion. †*
Ping Number, Ship Speed, Asynchronous Window Offset and Auxiliary Storage				
0020	pingNumber	4	USHORT	Ping number starts at 1 in each Q-MIPS file, 0 in each Isis file and is incremented automatically. Max = 4.29×10^9.
0024	asyncByteOffset	2	USHORT	When non-zero in Q-MIPS, indicates the presence of a unique asynchronous ping being stored with this ping, when 0 indicates the most recent asynchronous ping (if any) is being replicated; not used by Isis
0026	shipSpeed	2	USHORT	Speed of ship in knots multiplied by 100. *
0028	auxVal1	4	FLOAT	Auxiliary telemetry values, user-defined; displayed in Isis Sensors box. †*
0032	auxVal2	4	FLOAT	
0036	auxVal3	4	FLOAT	
0040	auxVal5	4	FLOAT	
Digitizer Parameters				
0044	auxAltitude	4	FLOAT	Altitude in meters from subbottom sensor if provided in nav telemetry (DSP, Isis) or from bottom detect on array processor (Q-MIPS).
0048	triggerChannel	2	USHORT	[1...4], Channel on which the sonar trigger is to be detected, from QMIPS.DAT.
0050	altSource	2	USHORT	Altitude source for water column removal and correction for slant range, 0: telemetry, 1-4: water column detection channel, 5: manual entry by user, set in QMI_PS.DAT or by user.
0052	waterColumn	4	USHORT	Number of samples in the water column as determined from altSource.

0056	triggerPeriod	4	USHORT	Number of samples in the trigger period determined from ping to ping by Q-MIPS.
0060	ch1_signalDivisor	2	USHORT	Chan 1 signal divisor •100. Set to 1 for Isis. For Q-MIPS, raw, signed, 12-bit, digitized sample is divided by this and truncated to 8 bits for display. The sign bit is dropped. The default divisor of 8 fits the 11-bit unsigned value into an unsigned 8-bit value. Value of 1 leaves the samples unchanged.
Towfish Telemetry				
0062	telemFishDepth	4	FLOAT	Depth of sonar source below sea level in meters. *
0066	telemFishHeading	4	FLOAT	Magnetic heading of fish in degrees. *
0070	telemFishPitch	4	FLOAT	Fish pitch in degrees, positive nose up. *
0074	telemFishRoll	4	FLOAT	Fish roll in degrees, positive is defined as starboard down. *
0078	telemFishAlt	4	FLOAT	Fish altitude above the sea floor in meters, from navigation telemetry or manual entry, takes precedence over auxAltitude. In Isis this is the tracked altitude. *
0082	telemSbotAlt	4	FLOAT	Subbottom sensor altitude above the sea floor in meters. Not used by Isis. *
0086	telemSpeedLog	4	FLOAT	Vehicle speed in meters per second from electromotive impeller speed log. †*
0090	soundVelocity	2	USHORT	One-way sound velocity multiplied by 30. Not used by Isis. †*

Channel 1 Sonar Parameters and Sampling Rate				
0092	ch1_floatRawRange	4	FLOAT	Higher resolution raw maximum slant range in meters. Used in DSP and Isis; not Q-MIPS.
0096	ch1_delayRange	4	FLOAT	Channel delay in meters, entered in Q-MIPS DIGITIZER menu in seconds and converted to meters. Not used in Isis.
0100	ch1_bandWidth	2	USHORT	Sonar channel bandwidth in kHz. Not used in Isis. *
0102	ch1_sampleScheme	2	USHORT	[1...5] For storage, digitized samples are decimated to 1024 samples per channel per ping using one of five methods defined as 1: average, 2: maximum, 3: minimum, 4: rms, or 5: none (meaning the first sample in the group to be downsampled is taken). The method is defined for each channel in QMIPS.DAT. Another parameter, *screen* downsample (0: skip, 1: average, 2: maximum, 3: minimum) is not stored but is also defined in QMIPS.DAT and may be changed from the keyboard. Set to 2 in Isis.
0104	ch1_rawRange	2	USHORT	Raw maximum slant range in meters, stored even if only processed imagery is saved, zero if channel is not present. On any asynchronous channel, this holds the async range.
0106	ch1_initialGain	1	BYTE	Initial channel gain. †*
0107	reservedForFloatSamp	2	USHORT	Sample rate in Hz used in DSP only.
0108	ch1_gain	1	BYTE	Channel gain. †*

0110	sampleRate	2	USHORT	Aggregate sample rate in kHz, set by user in Q-MIPS record mode setup. Not used in Isis.
0112	ch1_correctedRange	2	USHORT	Single-side range of corrected channel in meters, zero if corrected data are not saved. On any asynchronous channel, this holds the async delay in meters multiplied by 100. Not currently used in Isis.
Channel 2 Sonar Parameters				
0114	ch2_floatRawRange	4	FLOAT	Higher resolution raw maximum slant range in meters. Used in DSP and Isis; not Q-MIPS.
0118	ch2_delayRange	4	FLOAT	Channel delay in meters, entered in Q-MIPS DIGITIZER menu in seconds and converted to meters. Not used in Isis.
0122	ch2_bandWidth	2	USHORT	Sonar channel bandwidth in kHz. Not used in Isis. *
0124	ch2_sampleScheme	2	USHORT	[1...5] See ch1_sampleScheme description.
0126	ch2_rawRange	2	USHORT	See ch1_rawRange description. †
0128	ch2_initialGain	1	BYTE	Initial channel gain. †*
0129	ch2_gain	1	BYTE	Channel gain. †*
0130	oceanTide	2	USHORT	Altitude above Geoide (from RTK)
0132	ch2_signalDivisor	2	USHORT	Signal divisor multiplied by 100, see under Digitizer Parameters ch1_signalDivisor.
0134	ch2_correctedRange	2	USHORT	See ch1_correctedRange description.

				description.
Channel 3 Sonar Parameters and Range to Fish				
0136	ch3_floatRawRange	4	FLOAT	Higher resolution raw maximum slant range in meters. Used in DSP and Isis; not Q-MIPS.
0140	ch3_delayRange	4	FLOAT	Channel delay in meters, entered in Q-MIPS DIGITIZER menu in seconds and converted to meters.
0144	ch3_bandWidth	2	USHORT	Sonar channel bandwidth in kHz. *
0146	ch3_sampleScheme	2	USHORT	[1...5] See ch1_sampleScheme description.
0148	ch3_rawRange	2	USHORT	See ch1_rawRange description.
0150	ch3_initialGain	1	BYTE	Initial channel gain. †*
0151	ch3_gain	1	BYTE	Channel gain. †*
0152	range_to_fish	2	USHORT	Distance to fish in meters multiplied by 10.*
0154	ch3_signalDivisor	2	USHORT	Signal divisor multiplied by 100, see under Digitizer Parameters ch1_signalDivisor.
0156	ch3_correctedRange	2	USHORT	See ch1_correctedRange description
Channel 4 Sonar Parameters and Bearing to Fish				
0158	ch4_floatRawRange	4	FLOAT	Higher resolution raw maximum slant range in meters. Used in DSP and Isis; not Q-MIPS.

0162	ch4_delayRange	4	FLOAT	Channel delay in meters, entered in Q-MIPS DIGITIZER menu in seconds and converted to meters. Not used in Isis.
0166	ch4_bandWidth	2	USHORT	Sonar channel bandwidth in kHz. Not used in Isis.*
0168	ch4_sampleScheme	2	USHORT	[1...5] See ch1_sampleScheme description.
0170	ch4_rawRange	2	USHORT	See ch1_rawRange description.
0172	ch4_initialGain	1	BYTE	Initial channel gain. †*
0173	ch4_gain	1	BYTE	Channel gain. †*
0174	bearing_to_fish	2	USHORT	Bearing to fish in degrees multiplied by 100.*
0176	ch4_signalDivisor	2	USHORT	Signal divisor multiplied by 100, see under Digitizer Parameters ch1_signalDivisor.
0178	ch4_correctedRange	2	USHORT	See ch1_correctedRange description.

Nav System Parameters and Additional Fish Telemetry				
0180	waterTemperature	2	USHORT	CTD water temperature frequency times 100. †*
0184	eventNumber	4	SHORT	Last unique event or contact number; corresponds to contacts file in Q-MIPS.
0186	auxVal6	4	FLOAT	Auxiliary telemetry value, user-defined; displayed in Isis Sensors box. †*
0190	shipLatitude	8	DOUBLE	Ship's latitude in decimal degrees. †*

0198	shipLongitude	8	DOUBLE	Ship's longitude in decimal degrees. †*
0206	navEasting	4	FLOAT	Computed fish position in meters if navUnits are m. When the navUnits are degrees, the navEasting and navNorthing fields are combined into one double-precision floating point value to hold navLatitude.
0210	navNorthing	4	FLOAT	
0214	cableTension	4	FLOAT	Cable tension in from serial port. †*
0218	conductivity	4	FLOAT	CTD Conductivity frequency. †*
0222	navFishHeading	4	FLOAT	For backward compatibility with S-MIPS files only. All zeros. Not currently used.
0226	navFishSpeed	4	FLOAT	Fish speed in knots from nav telemetry or computed from navigation telemetry N and E velocities, used in imagery display calculations. If speed is not available from navigation telemetry, navFishSpeed is set to shipSpeed or calculated from point-to-point towfish position.
0230	navShipGyro	4	FLOAT	Ship's heading in degrees displayed on status monitor. †*
0234	auxVal4	4	FLOAT	Auxiliary telemetry value, user-defined; displayed in Isis Sensors box. †*
0238	navLongitude	8	DOUBLE	Computed fish position in decimal degrees if navUnits are degrees, otherwise zero.

0246	fishLayback	2	USHORT	Towfish layback (horizontal distance) in meters from navigation telemetry or manual entry, used in position calculations.
0248	navFixHour	1	BYTE	
0249	navFixMinute	1	BYTE	Time of the most recent navigation fix.
0250	navFixSeconds	1	BYTE	
0251	relativeBearingToFish	1	CHAR	Bearing to towfish in integral degrees off ship's course, ship to fish straight back is 000, to starboard is -090; calculated and stored only when you have entered a non-zero layback and a lateral offset (Veeder Root). Used in position calculations when non-zero. Not used in Isis.
0252	julianDay	2	USHORT	Number of days since the first of the year, since Q-MIPS v5.18. Month and day are calculated from this value.*
0254	cableOut	2	USHORT	Cable out in meters from navigation telemetry, manual entry or computed as a percentage of telemetered fish layback. †

† For storage only, not used in any Q-MIPS calculations.
* Set to the value received from navigation system or digital towfish; otherwise zero

Appendix B Isis BAC and GAC File Formats

Isis supports a number of file formats: Q-MIPS, BAC, GAC, and XTF. Each has distinct advantages. This appendix explains the BAC and GAC formats.

B.1 BAC File Format

You can create a BAC file from transducer beam patterns, or Q-MIPS or Isis can create it by using theoretical or empirical beam patterns. Although these files generally have the BAC (Beam Angle Compensation) extension, they reflect the measured or inferred beam *pattern* of the sonar rather than the *compensation* that will be applied. In this way, Q-MIPS and Isis need not be concerned with the origin of a BAC that is applied.

All BAC files are ASCII and consist of paired signal intensity values in decibels for each degree off vertical. A sample beam pattern (**SM28.BAC**) file is shown in Figure B-1.

```
/* Beam patterns in dB (angle off vertical, port, starboard)
*/
22.183 21.703     /* (Max level bias in dB, port &
starboard) */
131   /* number of angle bins */
012.858     12.166 /* angle off vertical, port (dB),
starboard (dB) */
112.858     12.166
212.858     12.166
312.858     12.166
412.858     12.166
...
...
...
1290.552    0.599
1300.000    0.000 /* angle off vertical, port (dB),
starboard (dB) */
```

Figure B-1. Sample BAC beam pattern file

B.2 GAC File Format

Q-MIPS or Isis can create Grazing Angle Compensation files, either theoretically or empirically. The GAC files are ASCII and consist of paired multiplicative corrections for each degree of grazing angle from 0 (far range) to 45. A sample GAC file (**SM28.GAC**) is shown in Figure B-2.

```
/* Grazing Angle Corrections */
46    /* number of angle bins */
01.858697   1.253826 /* grazing angle, port, starboard
corrections */
11.809185   1.233621
21.759672   1.213416
31.710160   1.193211
41.660647   1.173006
...
...
...
441.000000  1.000000
451.000000  1.000000 /* grazing angle, port, starboard
corrections */
```

Figure B-2. Sample GAC beam pattern file

Appendix C Mass Storage Options

Isis does not restrict you to recording your data on just one kind of medium. You can record to mass storage devices such a fixed hard disk, removable tape, or removable magneto-optical disk.

C.1 SCSI Bus Configuration

All Isis optional mass storage devices, which are internal, are SCSI devices and thus require the use of the Isis SCSI adapter card. Each drive and its adapter card has a unique ID (0 to 7) on the SCSI bus. SCSI devices are daisy-chained with internal devices connected to the adapter's internal connector; external devices are connected to the adapter's external connector on the Isis back panel.

Each end of the SCSI bus must be terminated. The Isis system is delivered with the hard drive terminated at the internal end of the SCSI bus. If additional external devices are connected to Isis, the last daisy-chained external device must be terminated. If no external devices are connected, the adapter will automatically terminate itself. The SCSI bus should be terminated only at its extreme ends. Isis can access SCSI devices as shown in Table C-1.

Do not over-terminate the SCSI bus. Improper termination can cause the SCSI adapter to fail!

Table C-1. SCSI designations and what they mean to Isis

SCSI ID	Drive Designation	Device
0	C: and D:	Hard drive
1	reserved	none
2	reserved	none
3	Y:	First Exabyte drive
4	Z:	Second Exabyte drive
5	E:	First M-O drive
6	F:	Second M-O drive
7	reserved for controller	none

C.2 Using Exabyte Tape Drives with Isis

Isis supports all current models of Exabyte tape drives. To complete the support, the stand-alone utility program **EXABYTE.EXE** is distributed with every Isis system that uses an Exabyte tape drive. The program may be used to copy files between hard disk and Exabyte tape drives. To copy a file from one Exabyte tape drive to another using **EXABYTE.EXE**, it is necessary to first copy the file from tape to hard disk, then from hard disk to the other tape.

If you have used software other than Isis to create a DAT or SEG-Y file, you can use the Exabyte utility to read or write (copy) the file. However, when using Isis software to write or read these file types, keep in mind the limitations shown in Table C-2:

Table C-2. Isis software's ability to write or read DAT and SEG-Y files

File Type	Write It?	Read It?
.DAT	no	yes
.SEG	yes	yes

Note: EXABYTE.EXE only recognizes standard DOS file structures. The utility cannot be used to work with SEG-Y format tapes written by Isis. Refer to ***'Using the SEG-Y Format on Exabyte Tape'*** on page 32 for a discussion on how Isis interprets the SEG-Y format.

You can also use **EXABYTE.EXE** to archive disk files to tape.

Tape motion is controlled in Isis via the Playback and Record mode Tape Control dialog boxes. Refer to Figure 3-7 on page 39 in the *Isis User's Manual, Volume 1*, for a discussion of the Tape Control dialog boxes.

To start the Exabyte program

- Type **`EXABYTE Y: [Enter]`**, or type **`EXABYTE Z: [Enter]`**

The following options are available through **`EXABYTE.EXE`**:

3. **Directory:** This option displays the contents of a tape. It will also display the names of files copied to it with the Exabyte program.

   In Isis, the **Directory** option only recognizes the file format that the Exabyte program writes to the tape during record mode or the Exabyte program's **Copy file** option.

4. **Copy File:** You use **Copy file** to copy files to or from an Exabyte drive. Choose either **Copy To** and **Copy From**.

- Option #1: **Copy To:** With this option, you can copy a single file or multiple files. The file will be copied to the tape at the current tape position. Any files that reside on the tape after the current position will probably be lost.For example, to copy all DAT Q-MIPS files in the **D:\QMIPS** directory to an Exabyte tape, use the **Copy to** option and specify **D:\QMIPS*.DAT** as the source name to copy.

- Option #2: **Copy From:** If you choose this option, Exabyte will prompt you for the number of the file (obtained from the Directory option) to be copied to hard disk, and prompt you to enter the destination path and name of the file to be created on the hard drive. Once the number is entered, the utility rewinds the tape and copies the file.

3. **Rewind tape:** The rewind option will position the tape at the beginning of the tape. If the erase option is specified at this point, the entire tape will be erased.

4. **Erase tape:** The erase option will erase the tape from the current tape position to the end. Before erasing the tape, the Exabyte program will ask you to confirm your intention. The tape will be automatically rewound at the end of the erase pass.

To erase the entire tape

- Choose **Rewind.**
- Choose **Erase**.

To erase the tape after a specific file

1. Get a Directory.
2. Choose the **Copy To** option.
3. Enter the number of the last file you want to save.
4. Copy that file to the file name **NULL** (the file will appear to copy, but no hard disk file will be created).
5. Choose **Erase**.

C.3 Using the SEG-Y Format on Exabyte Tape

Technically speaking, only genuine SEG-Y data can be written to SEG-Y tape media. However, few people still use SEG-Y tape any more; most now use Exabyte tape. Isis uses true SEG-Y data format on Exabyte tape. Except for the difference in the two tape media types, our format is indeed true SEG-Y.

SEG-Y requires a 3200-byte EBCDIC record followed by a 400-byte binary header at the beginning of the tape. Each trace starts with a 240-byte trace header followed by the trace data. The three headers are all documented in **SEGYFMT.H**. If you do not find this file on your Isis system, you can download it from our FTP site (no password needed).

The first 3200 bytes are written as a single block. This block is followed by a 400-byte single block. (You must change block size to read the tape — this is required by the SEG-Y specification.) When trying to read SEG-Y format, if the read software does not change block size, then it will fail to read the data. Isis includes these blocks according to specification.

As stated elsewhere in this manual, you can also use a "modified" SEG-Y format on optical disks. The disk format is "modified" because of the difference in the types of media: Tape access is sequential ("flat file") whereas disk access is random. However, the SEG-Y specification only accommodates sequential, flat-file access, so Triton Elics has modified the SEG-Y format to work with disks.

Refer to ***'Setting Up Tape to Record or Play Back'*** in the *Isis User's Manual, Volume 1*, to see how to set up Isis for recording on tape.

C.4 Using Magneto-Optical Drives with Isis

Isis can recognize and use up to two multi-function magneto-optical drives if they are logically attached to the SCSI controller as drives E: and F: in a DOS or Windows environment. For 486-based systems, the SCSI controller is an Adaptec AHA 1542C (or 1542B, 1542CF); for Pentium-based systems, the SCSI controller is an AIC-7870 on the CPU board. The two drives should be configured for SCSI ID numbers 5 (for drive E:) and 6 (for drive F:). The M-O drives installed in an Isis system have large capacities (one or more gigabytes per M-O) and can read from and write to several types of cartridges.

C.4.1 Different Sector Sizes, Different Purposes

Magneto-optical ("M-O") cartridges come low-level formatted with either 1024-byte sectors or 512-byte sectors. The 1024 size is typically used for UNIX systems, while 512-byte sectors are more common for Microsoft operating systems. Isis, which run under Microsoft operating systems, expects to "see" (read) 512-byte sectors. Isis can also read 1024-byte sectors if the M-O was high-level formatted for DOS, but performance suffers: For an M-O low-level formatted at 1024-bytes per sector, Isis reads the M-O at about 10% of normal.

Whenever you are using an application such as Isis on Microsoft's Windows 95, Windows NT, Windows 3.11 or DOS, use cartridges low-level formatted for 512-bytes/ sector. Never use 1024 bytes/sector M-O cartridges with Isis!

Note: An M-O cartridge's capacity is independent of its low-level bytes per sector format; one cannot deduce the bytes per sector from the M-O's capacity. The only way to know the bytes per sector of a given M-O is to inspect the labeling on the cartridge and read how many bytes per sector the manufacturer says it has.

C.4.2 Typical HP Cartridge Types

The following table lists HP model numbers for Isis-compatible media. Compatible media are also available from several other manufacturers.

Table C-3. HP magneto-optical media that are compatible with Isis

Capacity	Rewritable
600 MB	92279A
1.2 GB	92279T
2.4 GB	92279F

Triton Elics recommends you use HP media cartridges because they are very reliable and have a 30-year warranty.

Media cartridges with 512-byte sectors written by other compatible magneto-optical drives (for example, Sony and other ISO-standard drives) can also be read by the HP multi-function drives.

C.4.3 High-Level Formatting Considerations

In general, you need one hard disk partition per side of the M-O. You accomplish this using AFDISK. In addition to knowing the low-level format of an M-O cartridge, such as the number of bytes (typical 512 or 1024) per sector, you need to take into account the M-O cartridge's high-level format that will be used with Isis. An M-O cartridge that will be used with Isis must be high-level formatted with one ***DOS*** hard disk partition.

To high-level format an M-O cartridge, refer to C.4.3.2 ('Formatting the M-O after Backing up Your M-O's Data') on page 32.

If you believe your data disk already has been high-level formatted with what AFDISK calls Standard Hard Disk Format (***i.e.***, the DOS high-level format), then exit Windows and re-start Windows 95 with the **WIN/D:F** command. You should now be able to read the 1024 Byte/sector M-O disk, albeit slowly.

C.4.3.1 Backing Up Your M-O Data Before Reformatting

Because formatting destroys any data existing on the cartridge, you will want to back up your M-O data before formatting.

To back up your data from the M-O

1. With the M-O cartridge in Drive E:, exit Windows 95. (When the message comes up that allows you to go to DOS, close Windows completely and go to DOS — not just the DOS shell).
2. In DOS, use **COPY** or **XCOPY** to copy your files from your M-O to your D: drive.

C.4.3.2 Formatting the M-O after Backing up Your M-O's Data

As noted above, HP cartridges come pre-formatted with 512-byte (or 1024-byte) sectors, but high-level formatting must be completed and a DOS-style partition must be created on these cartridges before they can be used.

If your data is backed up as indicated in the previous subsection, you now are ready to reformat your M-O with a high-level format suitable for DOS and Windows. You use the AFDISK utility to do this to both sides. This will erase any data on the cartridge!

To high-level format side #1 of a magneto-optical cartridge

1. Exit Windows completely (don't just shell out to DOS).
2. At the DOS prompt, go to the **C:\ASPI** directory, where **AFDISK.EXE** utility is located.
3. Insert a new cartridge in the **E:** or **F:** drive.
4. Type **AFDISK**, and press **[Enter]** to run AFDISK.
5. In AFDISK, take the following steps to partition and label the cartridge.
   a. Use the arrow keys to highlight the SCSI ID of the drive which holds the cartridge to be partitioned. This will be **5** for drive **E:** or **6** for drive **F:**. Verify that the model number of the SCSI device that you choose is C1716T. Once the drive is highlighted, press **[Enter]** to select it. Do ***NOT*** select SCSI ID 0!

When formatting M-O cartridges, care must be taken not to erase the hard drive. NEVER use the AFDISK.EXE to access SCSI ID 0!

If the media in the selected drive is unformatted, AFDISK displays a message:

```
This disk is unformatted.
--Press <Esc> to continue--
```

If this message does not appear, STOP! The cartridge may already contain data. Formatting or creating a partition will delete any previously saved data!

a. Press **[Esc]**. The system notifies you of the formatting options:

AFDISK allows users the option of a floppy format or a hard disk format for the medium selected. Hit the **[F1]** key for more information on disk formats
--Press <Esc> to continue--

b. Press **[Esc]** to display the formatting options.

c. Use the arrow keys to select **Standard Hard Disk Forma**t and press **[Enter]** to select this option. AFDISK will display a message asking you to wait while the disk is formatted. This will take about ten seconds.

- When the formatting is completed, logical drive information will be displayed in the lower left corner of the display and a partition table for the cartridge will be displayed in the upper right hand corner of the display.

d. Verify that no partitions exist (the partition table is empty).

- If the partition table is ***not*** empty, you are attempting to partition a cartridge side that has already been partitioned. **STOP**. ***The cartridge may contain data that will be lost if you modify the partition table.***
- If the partition table is empty, press the **[Insert]** key to create a partition.

e. Press **[Enter]** to accept the full capacity of one side of the cartridge as the partition size.

f. Press **[Enter]** to create the partition.

g. Press **[Esc]** to quit AFDISK. AFDISK will ask you to re-start the computer by pressing **[Ctrl] [Alt] [Del]**. Do this and wait for the system to go through its start-up routine.

h. At the DOS prompt, type **LABEL E:** (or **F:**) to assign a volume label to this side of the cartridge.

To high-level format side #2 of a magneto-optical cartridge

1. Eject the cartridge you just formatted.
2. Turn it over and insert it again.
3. Run AFDISK again from the DOS prompt.

4. Repeat steps 7 through 15 of the procedure, 'To high-level format side #1 of a magneto-optical cartridge'.

Partitioned cartridges, inserted into the HP drives, function as DOS logical drives. All DOS and Q-MIPS commands function normally on rewritable cartridges. Write-once cartridges, however, cannot be erased functionally once they have been written.

To partition a new MO using AFDISK.EXE with NT

1. Download a file from our FTP site called EBD_95.ZIP.
2. Unzip it to a floppy.
3. With the floppy in the drive, make the floppy bootable by typing this command from any DOS or Win95 machine:

```
SYS C: A:
```

4. Shut down the NT machine that is equipped with the MO drive or drives.
5. Put the floppy in the NT machine, restart it, and allow the machine to reboot from the floppy.
6. Put a new (never before formatted or partitioned) MO cartridge in your MO drive.
7. At the `a:\` prompt, type `AFDISK` and press [Enter].
8. Select the MO drive you want to partition.

If your MO cartridge is new (unformatted), you will get the message, **This disk is not formatted** If your MO cartridge is not new (has already been formatted/partitioned), AFDISK will say it cannot proceed. Continue with ***'To high-level format side #1 of a magneto-optical cartridge'*** on page 32.

C.4.3.3 Restoring Your Backed Up Data after Reformatting

Your reformatted M-O is now ready to receive the data you backed up.

To restore your backed up data to the newly formatted M-O

- Copy your files from the D: drive back to your newly formatted M-O cartridge on E:

C.4.3.4 Restarting Windows 95 after Restoring Your M-O's Data

If you have restored your data to your M-O, you are now ready to resume using it with Windows 95.

To make Windows 95 see your M-O if it has 1024 bytes per sector

- Re-start Windows 95 by typing **WIN/D:F**.

This will permit Win 95 to recognize your low-level formatted M-O disk that has 1024 bytes/sector. As previously noted, reading the 1024 bytes/sector M-O will be slow (about 10% normal).

Appendix D Serial Interfaces

As noted in **Chapter 3, 'Using the File Menu'**, ***Isis User's Manual, Volume 1***, Isis supports up to 16 serial **com** ports, many of which can be used to feed navigation information to Isis from external devices that can transmit over serial ports. You can manage the output of an external device's transmission by writing your own serial interface string and using it as a template for the device.
This appendix explains:

- the connections you need to hook up your serial input device to your Isis system
- how the Isis software receives the data from the serial device
- what tokens can be used to make a serial interface template, and
- what a typical template looks like

D.1 Connection

Serial (RS232) input to Isis is done through the 9-pin **com** connector(s) found on the back panel of the Isis. The basic Isis system is equipped with a **com**1 port. **com**2 is reserved for the trackball. Additional **com** ports are available as options. The **com** ports are female IBM AT DB-9 serial connectors. Triton Elics ships them with the pinouts shown in Table D-1. If your Nav system pinouts differ from these defaults, you may want to write them in here.

Table D-1. Isis pinouts for COM1 serial port

Isis uses these pins	for these functions	Your Nav System uses
Pin 1 <----------	Carrier Detect ----------	_____
*Pin 2 <----------	Receive Data ----------	_____
*Pin 3 ---------->	Transmit Data ---------->	_____
Pin 4 ---------->	Data Terminal Ready ->	_____
*Pin 5 ----------	Ground ----------	_____
Pin 6 <----------	Data Set Ready ----------	_____

Pin 7 ----------	Request To Send ------>	_____
Pin 8 <----------	Clear To Send ----------	_____
Pin 9 <----------	Ring Indicator ----------	_____

*Only pins 2, 3, and 5 are needed for a complete interface. All other pins are physically connected but not used by the Isis software.

Some serial communications devices use DB-25 connectors. These may be connected to Isis with the installation of a DB-9 to DB-25 converter or similar cable, which may be purchased at an electrical supply shop.
The serial cable should be connected to Isis with the power OFF.

D.2 Receive Data Format

Because Isis can connect to many different navigation or telemetry systems, a generic user-definable method has been developed to allow easy integration of new interfaces. Isis can accept and store a wide range of navigation and telemetry information. Although both binary and ASCII data may be received over a serial port, use of a user-defined navigation template requires serial data to be received in ASCII.

Note: All values transmitted over the serial port ***must*** be separated (delimited) by a non-numeric character. Numeric characters are included in the following set:

```
{0123456789.-}
```

Here's what happens when Isis gets data from a serial interface:

1. Isis receives a single transmission string from the serial port. This string is terminated with any character (or characters) having an ASCII value of less than 14. This includes carriage return and line feed (CR, LF).
2. Isis parses the serial transmission based on the alphanumeric combination of characters.
3. Isis assigns each number in the string to the respective field described by the Serial Template, described next.

D.3 Template Construction

For each **com** port and its associated serial device that will be communicating with Isis, you can use a ready-made template or create your own to be used as the interface.

To select or create a template in Isis

1. From the File menu, select **Record Setup**, then **Serial Ports**.
2. Choose a **com** port to be used with a given serial device you have in mind.
3. Enable status by clicking in the **Status** box. A check mark will be visible in the **On** box when status is enabled.
4. Either:

   - Refer to the buttons displaying ready-made "server" software types (**NMEA0183**, **TSS**, **Seatex MRU**, **SeaBat #1**, **SeaBat #2**), choose one to be your template, and choose **OK.**

   or

   - Create your own in the Navigation/Telemetry text box provided and choose **OK**. (A sample user-defined template appears in Figure D-1.)

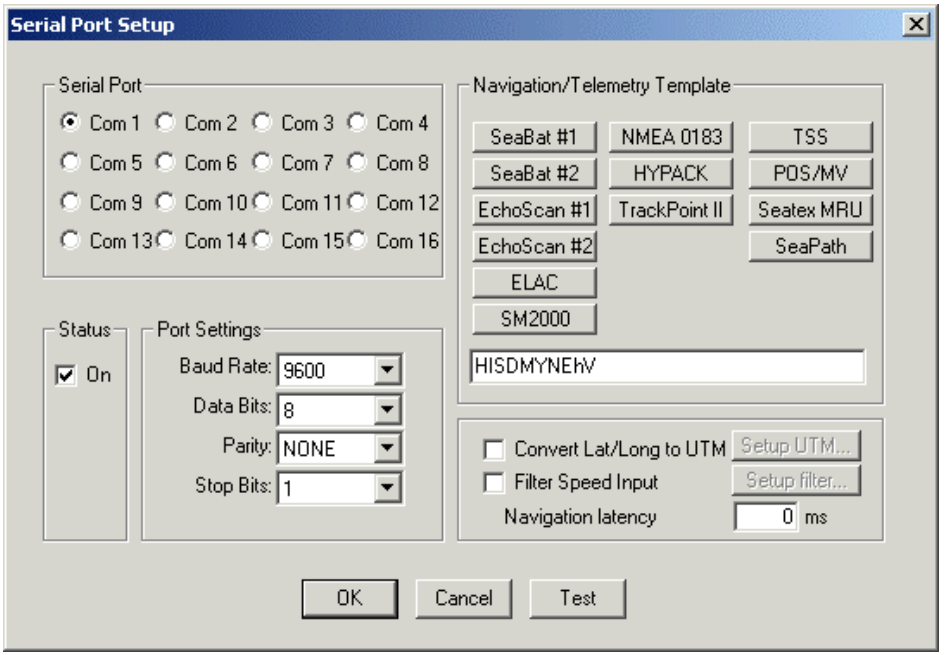


Figure D-1. Sample of a user-defined navigation or telemetry template

The template can accept up to 200 characters from the list shown in **'Values Allowed Over Serial Interfaces and Stored by Isis'.**

D.3.1 Example of Template Construction

Say a simple data logger transmits data over a serial port at 2400 baud, 1 stop bit, 8 data bits and even parity. An example of a string transmitted over such a serial port might be

4/20/90 17:31:22 NORTH 93285.35 EAST 319294.29, H:344.0

Before Isis can use the above data, you need to set up a **com** port to receive it. You do so in the Serial Port Setup dialog box (Figure D-1 in this book). In this case, you would set the Baud Rate to **2400**, Data Bits to **8**, Stop Bits to **1** and Parity to **Even**.

Second, create the serial navigation template. The example transmission string previously mentioned shows that data is formatted by the data logger in the following order:

```
day month year hour minute second north east heading
```

For this example, we will assume that the heading is "course made good," that the heading has been processed by the data logger, and that no other heading is available. Consequently, the towfish will have to use that heading. Also assume that Isis will synchronize its system time and date to that of the data logger. This set of assumptions will enable Isis to correctly return coordinates for imagery pixels when the cursor is moved around the graphics display.

When you construct a template to match the data transmitted with the template codes just described, the result would be a string in a tokenized format:

```
DMYHISNEh
```

Isis interprets the tokenized ***DMYHISNEh*** string as follows:

D	**=**	**day**	**20**
M	**=**	**month**	**4**
Y	**=**	**year**	**90**
H	**=**	**hour**	**17**
I	**=**	**minute**	**31**
S	**=**	**second**	**22**
N	**=**	**northing**	**93285.35**
E	**=**	**easting**	**319294.29**
h	**=**	**towfish heading**	**344.0**

All letters sent with the serial transmission will be ignored except for those used to separate the individual values.

Note: For date and time, Isis uses the NMEA0183 standard. See **'How Isis Works with NMEA0183 Strings'** in Volume 2

As soon as you put Isis in Record mode, Isis will begin monitoring the serial ports for transmissions. To test the interface, use the **COM Port Test** option in the Tools menu (see **'Com Port Test'**, **Isis User's Manual, Volume 1**) or choose **Test** in the Serial Port Setup dialog box. Both access methods lead to the same **com** Port Test dialog box.

Template entries are CASE SENSITIVE (that is, upper or lower case entries are treated as unique entries) and must not contain any space characters. Values are decoded as METERS except where noted. For Isis to interpret northings and eastings as feet, the template entries must include an upper case F.

D.3.2 Values Allowed Over Serial Interfaces and Stored by Isis

Isis has a wide range of user-defined tokens that you can use in your templates. When some of the user-defined tokens are surrounded by delimiters, the meaning of the token changes. Isis can use and store many character tokens over a serial interface (Table D-2).

Note: In Table D-2, some tokens are enclosed in delimiters. Delimited tokens are distinct from non-delimited tokens. In the table, we have used braces as delimiters, but we could have used parentheses or brackets — all are valid; Isis treats them the same. Both types of tokens (delimited and non-delimited) are explained in the table.

Table D-2. Delimited and non-delimited tokens used by Isis

Token	Meaning
0	(zero char) Fish depth in meters. (Manual depth overrides this value.)

1	Auxiliary Value 1
2	Auxiliary Value 2
3	Auxiliary Value 3
4	Auxiliary Value 4
5	Auxiliary Value 5
6	Auxiliary Value 6
7	Fish Altitude in (meters)
8	Fish Pitch (degrees)
9	Fish Roll (degrees)
;	Pressure temperature (CTD data)
>	Bearing to Fish (degrees). This is the same as the **{bf}** token.
?	Range to Fish (meters)
D	Day
E	Easting (or longitude if **$** is included in the nav template) for the fish position — see **{lom}** in this table.
F	Causes Northing and Easting to be converted from feet to meters according to the equation (N|E) * (39.37/12.0)
G	Gyro (direction ship is pointing)
H	Hour
I	Minute
J	Julian day
L	Latency in seconds (age of the navigation at point when first serial character received): "fix Late" (seconds to subtract from transmitted time). This template character now accepts nav latency in decimal form. Receive time in milliseconds, minus this value, is posted in the XTF file's **NavMillisecond_Clock** field.
M	Month
N	Northing (or latitude if **$** is included in the nav template) for the fish position — see **{lam}** in this table.
O	[capital "Oh"] Next event number to use (changing value forces event). In ***Isis User's Manual, Volume 1,*** refer to the sections ***'Mark Event'*** on page 143, for setting events, to ***'Overlay'*** on page 123 for displaying event marks, and to ***'5.6 Sending Isis Imagery to a Plotter/Printer,'*** starting on page 90, ***Isis User's Manual, Volume 1,*** for information on annotating and printing events.
P	Cable Tension
Q	Conductivity frequency (CTD data)

S	Seconds. This can be a decimal number to include a fraction of a second.
T	Velocity East ***Note:*** If speed (**V**) is ***not*** specified, and velocity North and East ***are*** specified, then speed is computed from the velocity north and east.
U	Velocity North. Fish Speed = sqrt(T*T+U*U) * 1.9438445 ***Note:*** If speed (**V**) is ***not*** specified, and velocity North and East ***are*** specified, then speed is computed from the velocity north and east.
V	Fish Speed (knots) — main speed used for image correction
W	Fish Depth in feet (if no manual depth is set)
Y	Year
Z	Benthos flag is set TRUE. Characters 121 132 (inclusive, zero-based indexing) in the receive string are stored as downlink and saturation information. The characters are then blanked-out to prevent parsing errors.
a	Auxiliary Altitude (meters)
b	Temperature Frequency (CTD data)
e	Magnetometer X
g	Channel 1 Gain Code (0 255)
h	Fish Heading (degrees)
i	Current Line ID
j	Channel 2 Gain Code (0 255)
k	Channel 3 Gain Code (0 255)
l	[small letter “ell”] Layback (in meters)
m	Fish Speed. (m/s) (This value is multiplied by 1.9438445 to become knots.)
n	Channel 4 Gain Code (0 255)
o	[small letter “oh”] Cable Out (in meters)
q	Channel 1 Initial Gain Code (0 255)
r	Channel 2 Initial Gain Code (0 255)
s	Speed log (knots) from impeller or other such sensor; stored only
t	Channel 3 Initial Gain Code (0 255)
u	Channel 4 Initial Gain Code (0 255)
v	Ship Speed (in knots; stored only)
w	Magnetometer Y
x	Ship Longitude (decimal degrees) or easting (meters); stored

	only
y	Ship Latitude (decimal degrees) or northing (meters); stored only
z	Magnetometer Z
{0}	[character zero between delimiters] Non-zero fish depth. Isis accepts this depth value of if it is non-zero and there is no manual depth set.
{DOT}	Distance off track (meters)
{KP}	KP (Kilometer post) (Kilometers)
{align=n}	The template token {align=***n***} causes Isis to set an absolute parsing point in the input string. Alignment occurs after the ***nth*** character. If the alignment value is **0**, as in **{align=0}**, the token causes processing to start with the first character in the input string. If **{align=}** is given without specifying ***n***, **0** (zero) is used as the value. If ***n*** is specified to be negative or beyond the size of the current input string, further processing halts at that point. Any processing that happened before the **{align=*n}*** token was encountered, still occurs. See ***'Examples of Character Alignment'*** on page 53.
{bf}	Bearing to Fish (degrees). This is the same as the **>** token.
{d}	Pressure in decibars. Value is converted to psia by multiplying by 1.45038. Fish depth then is computed as described for **{p}** in this table.
{hy}	Yaw Heading. Yaw is computed to be (0.99 * old value + 0.01 * new value), which performs an exponential-decay smoothing.
{h}	Heave. When processing multibeam data, distance below the sea surface is computed to be (depth offset + sensor depth - heave).
{i}	Changed every occurrence of the letters '**E**' or '**e**' to a blank space. Useful in causing Isis to ignore scientific notation.
{KLEIN595}	Makes Isis aware of strings coming from a Klein 595 sonar.
{le}	Electronics-bottle leak detector.
{lam}	Serial template to parse fish latitude stored with separate degrees and minutes. Example: **S 44 38.231 W 121 17.455**. The template to parse this is **{lam}N{lom}E**, where **N** is the token for the fish position.
{log}	If **0** is sent over serial port, causes switch to display only. If **1** is sent, data are logged.
{logn}	Behaves like **{log}**, except that when a **1** is sent, it will be

	followed by a file name to be used for the file name switch.
{lom}	Serial template to parse fish longitude stored with separate degrees and minutes. Example: **S 44 38.231 W 121 17.455**. The template to parse this is **{lam}N{lom}E**, where **E** is the token for the fish position.
{lp}	Power-bottle leak detector
{ms}	Ship speed in m/s. Converted to knots by multiplying by 1.9438445.
{m}	Conductivity in MMHO/cm. Converted to Siemens/meter by dividing by 10.0.
{pattern= input_string}	Isis finds any pattern of characters in ***input_string***. Processing of the string proceeds from that point forward. Pattern matching is case-sensitive. If a match is not found, processing stops. Any processing that happened before the **{pattern=*input_string}*** token was encountered, still occurs. To specify a '**}**' character as part of a pattern string, put a '\' character in front of it. For example, **{pattern=\}}** will cause Isis to look for a closed-brace character. To specify a '\' character as part of a pattern string, use two backslashes (\\). See ***'Examples of Pattern Matching'***.
{pf}	Pressure Frequency (CTD data)
{p}	***{p}*** is pressure in psia. Fish depth is then computed from pressure according to a standard UNESCO formula as follows: $Z_s(P,\phi)$ = 9.72659x10sP – 2.512x10-1P2 + 2.279x10-4P3 – 1.82x10-7P4 [g(ϕ) + 1.092x10-4P] Where g(ϕ), the international formula for gravity, is given by: g(ϕ) = 9.780318 (1 + 5.2788 x 10^{-3} $\sin^2\phi$ + 2.36 x 10^{-5} $\sin^4\phi$) Z = depth in meters P = pressure in MPa ϕ = latitude The above equation is true for oceanographers' standard ocean, defined as an ideal medium with a temperature of 0 C and salinity of 35 parts per thousand. Other methods for calculating

	pressure or depth can be found at: **http://www.npl.co.uk/npl/acoustics/techguides/soundseawater/content.html#PD**
{c}	Conductivity in Siemens/meter
{tv}	Turbidity. This is the same as the | ("pipe" symbol) token.
{t}	Ocean tide (only if manual tide isn't set)
{v1}	Voltage value 1 (displayed in Window→Status and Control →Towfish Status in +95 field). Voltage values are displayed but not stored.
{v2}	Voltage value 2 (displayed in -95 field)
{v3}	Voltage value 3 (displayed in +15 field)
{v4}	Voltage value 4 (displayed in -15 field)
{v5}	Voltage value 5 (displayed in +5 field)
{v}	Velocity of sound in m/s (one-way travel). Isis defaults to 1500 m/s.
{w}	Water temperature (degrees C)
{y}	Yaw in degrees
|	("pipe" symbol) Turbidity. This is the same as the {tv} token.

D.3.2.1 Examples of Pattern Matching

Given the hypothetical template string:

ap{pattern=compass}h

and the hypothetical input string:

```
altitude 38.3, pressure 93.535, diag code 9a8dc8339,
compass 173.44
```

Isis parses the aforementioned sample string by applying the **{pattern=*input_string*}** template as follows:

1. Finds the first numeric character. In this case, it's **3**.
2. Assigns 38.3 to the **a** token, or auxiliary altitude.

3. Finds the next numeric character. In this case, it's **9**.

4. Assigns 93.535 to **p** token, or pressure (psia).

5. Searches the input string, starting after 93.535, for an occurrence of the pattern **compass**.

6. Finds the next numeric character following the token **compass**. In this case, it's **1**.

7. Assigns 173.44 to **h** token, or heading.

See Table D-2 for rules that apply to this token.

D.3.2.2 Examples of Character Alignment

Given the hypothetical template string:

{align=3}8

and the hypothetical input string:

9A946.35

Isis parses the aforementioned sample string by applying the **{align=*n*}** template as follows:

1. Isis sets the processing point after the third character in the input string. In this case, the current processing points to the **4** character.

2. Isis assigns 46.35 to the **8** token (pitch).

See Table D-2 for rules that apply to this token.

D.3.3 Performing Math on Template Tokens

You can use any of the four basic mathematical operators with your template tokens.

+ **addition operator: add to next value**

- **subtraction operator: subtract from next value**

* **multiplication operator: multiply by next value**

/ **division operator: divide by next value**

You construct an expression according to the following syntax:

{OperatorValue}Token

- ***Operator*** is one of the operators cited above.

- ***Value*** is a numerical value or constant that will be applied to ***Token***.
- Token is any token cited in 'Values Allowed Over Serial Interfaces and Stored by Isis'.

Note: ***Operator*** and ***Value*** must be contiguous without intervening spaces, and the operator-value pair must be contained within delimiters of braces, parentheses, or brackets. ***Token*** must immediately follow the closing delimiter, without a space. If more than one math operator is specified on a single variable, the order of operation is: multiply, subtract, divide, add.

Example of math performed on a template token:

```
{/10}G
```

This instructs Isis to take the current value for Gyro, divide it by ten, and store it. This is a useful routine because raw Gyro output is stored in integer form, where all digits up to the rightmost digit represent whole degrees, while the rightmost digit represents tenths of degrees. If the stored integer is greater than 360, Isis will regard the number as out of bounds—unless it is first "translated" by the foregoing routine to express the number as a combination of degrees and tenths of degrees.

Another example:

```
{*57.2957795}h
```

In the foregoing example, the transmitted value is converted from radians to degrees and that result is assigned to the serial template token **h**, which is towfish heading.

Another example:

```
{*0.90}{+10.5}o
```

This operation computes Cable Out by taking 90% of the transmitted value, adds 10.5 and assigns the result as Cable Out (the serial template token **o**).

A final example:

```
{-100}{/3.2808}o
```

This instructs Isis to subtract 100 feet from the Cable-Out value (token **o**), divide the result by 3.2808, and store it. The number 3.2808 is a constant used to convert feet to meters.

In the above examples, you just as easily could have used parentheses **()**, or brackets **[]** instead of braces **{}**. Isis treats them the same.

D.3.4 Template Instructions That Do Not Evaluate to a Number

Certain letter designators do not correspond to a value transmitted over the serial interface (and therefore do not evaluate to a number). Instead, these special letter designators act as signals to Isis that certain instructions are to occur before parsing the navigation. These designators, shown in Table D-1, should be placed at the front of the template.

Table D-1. Template letter designators that do not return a number

Letter	Meaning
A	Forces Isis to synchronize to transmitted time
B	Forces Isis to synchronize to transmitted date.
F	Tells Isis to interpret northings and eastings as feet.
R	Flag which triggers an event closure (sent by MOSNAV) in Isis — used for verification only.
X	Placeholder only; tells Isis to ignore the next value.
Z	Benthos SIS-7000 uplink flag: convert depth (m), conductivity, and pressure from frequency to real values.
P	DTDAS flag is set TRUE.
-	Tells Isis to reverse the sign of the next value. Use this in front of longitudes which are transmitted as positive values in the western hemisphere. ***Note:*** This is not the same as the subtraction operator for described in ***'Performing Math on Template Tokens'***.
!	The character that follows '**!**' is compared to the first character in the receive string. If they don't match, the string is rejected. Example: **!$** in the template will cause Isis to reject any serial update that doesn't begin with a dollar-sign (**$**) character.
$	Informs Isis that northing and easting are actually latitude and longitude (otherwise, UTM). As a result, Isis will interpret this to be a NMEA string.

Event	When this word is received, the number that follows the word **Event** is taken to be the next event number. In ***Isis User's Manual, Volume 1,*** refer to the sections ***'Mark Event'*** on page for setting events, to ***'Overlay'*** on page for displaying event marks, and to ***'5.6 Sending Isis Imagery to a Plotter/Printer,'*** for information on annotating and printing events. See also Table D-1.
Replay	When this word is received, the number that follows the word **Replay** is taken to be the contact requested. That contact will be recalled from mass storage if the appropriate volume is available. See also Table D-1.
{CONIN}	Monitor serial port for contact REPLAY messages.
{CONOUT}	Send contact logging messages to nav computer over serial port. See also ***D.6 ('Transmit Data Format')***.
{TELEMOUT}	When a contact is logged in the Target utility, information about the contact is transmitted back over the serial port.

Note: For information on using CTD data with your nav interface, refer to ***Appendix G ('How Isis Processes CTD Data')***.

D.4 Special, Ready-Made Templates That Isis Can Use

By default, Isis uses its own internal parsing rules to handle template strings. However, you can override that mode of operation by having Isis use a specific template that Isis recognizes. Isis will use certain "canned" templates "as is," without further modification, should you deem those templates apply to your survey situation. These templates also appear in the Serial Port Setup dialog box (Figure D-1). Their meanings are shown in Table 4-1.

Table 4-1. Special, ready-made templates Isis can use "as is"

Template	Use or Location in Isis Software
NMEA0183	This is a widely recognized, industry-standard interface specification.
TSS	This template configures the serial port for input from a TSS motion sensor, specifically the "TSS1" string described in the TSS documentation.

SEATEX	This template configures the serial port for input from a Seatex MRU.
CMSSS	This template is used for a special navigation string generated by German Hydrographic Bureau (BSH) navigation systems. It is not applicable to other types of navigation input.
HYPACK	This template also appears in the Serial Port Setup dialog box. Also see ***4.2, 'Serial Port Setup'*** in Volume 1, and ***6.8, 'Hypack DDE (Record Only)'*** in Volume 1.
POS/MV	This template also appears in the Serial Port Setup dialog box. Also see ***'4.2 Serial Port Setup,'***, Volume 1.
TrackPointII	This template also appears in the Serial Port Setup dialog box. Also see ***4.2, 'Serial Port Setup,'***, Volume 1.
SeaPath	This template also appears in the Serial Port Setup dialog box.

All except **CMSSS** are selectable from the Serial Port Setup dialog box (Figure D-1) in Isis software. To specify a CMSSS template, type **CMSSS** in the Navigation/Telemetry Template portion of the Serial Port Setup dialog box.

D.4.1 How Isis Works with NMEA0183 Strings

Isis can interpret several standard NMEA0183 strings, called ***sentences***. To have Isis use NMEA type of transmissions instead of other types, choose the NMEA0183 navigation template shown in the Serial Port Setup dialog box. If you choose **NMEA 0183** in the Isis serial port setup dialog box, Isis ignores standard parsing rules and instead decodes the transmitted string as a NMEA0183-compatible data packet.

Isis recognizes the following NMEA0183 packet types:

GGA, RMC, GLL, VTG, ZDA, HDM, HDT, SHR, KLA, TSP

In addition, you can add tokens to prevent the use of any specific packet. For example, if a GPS receiver is transmitting both GGA and GLL packets, the navigation may jitter between two positions. In such a case, you can prevent the parsing of **GLL** by specifying **NOGLL** in the same template after NMEA0183. The following tokens prevent the parsing of the respective packets:

NOGGA, NORMC, NOGLL, NOVTG, NOZDA,
NOHDM, NOHDT, NOSHR, NOKLA, NOTSP

D.4.1.1 How Isis Deals With Heading Issues in NMEA0183 Strings

Isis can process heading packets that can occur in NMEA0183 strings. Two packets in particular affect the behavior of Isis:

HEHDT
HCHDT

When both are being received, **HEHDT** takes priority over **HCHDT**.

D.4.1.2 How Isis Deals With Time Issues in NMEA0183 Strings

Isis can be synchronized or de-synchronized with the computer clock with respect to NMEA0183 strings. Syncing the Isis computer clock is now determined by taking the time from a single packet type. The priority is:

NMEA_ZDA 4 // This is most preferable.
NMEA_RMC 3
NMEA_GLL 2
NMEA_GGA 1 // This is least preferable.
NMEA_ANY 0
NOCLOCK // This prevents Isis from synchronizing Isis system clock with GPS time. By default, Isis always synchronizes the system clock with GPS time.

Some parts of the NMEA0183 template are not affected by the **NO** modifier. Additional tokens **after** NMEA0183 further control the processing of NMEA packets:

POS=NODIFF //This causes Isis to use only non-differential positions from GGA packets.
POS=DIF //This causes Isis to use only differential positions from GGA packets.
NOCLOCK //This prevents Isis from synchronizing Isis system clock with GPS time. By default, Isis always synchronizes the system clock with GPS time.
UTM //This forces nav as UTM (meters). By default, when NMEA0183 is selected as a template, navigation is

assumed to be in lat/long degrees. This token overrides this behavior and forces nav back to UTM.

SAVERAW //This causes Isis to save the exact serial string to the current XTF file before processing in "raw" format.

SHIPPOS //This tells Isis that the position coming in on the selected com port will be assigned to the ship position only. This is useful when a navigation system is sending sensor position on one com port while a GPS receiver is reporting ship position on another com port.

If only one nav input is available, do not use {SHIPPOS}.

All NMEA sentences are preceded by six characters. The first three characters are **$XX**, where **XX** is the two-letter code for the source of the navigation solution. For example:

$GPGPS
$LCLORAN C

Isis ignores these first three characters. As many as three more characters can follow the first three. The next three characters after the first three characters in each string identify the specific NMEA sentence to follow. All sentences are comma-delimited and end with ***XX**, where **XX** is a checksum. Isis (and Q-MIPS) support five sentences, shown next:

$PKLA // Serial output from Klein 2000. For further information on this feature, consult the manufacturer's documentation.

$EGTSP // Serial output EG&G DF1000. For further information on this feature, consult the manufacturer's documentation.

RMC // Recommended Sentence C with date, time, latitude, longitude and heading
GGA // Time and position (in latitude and longitude)
GLL // Latitude and longitude
VTG // Course and speed made good
ZDA // Time and date

Each of the first four of these sentences can be disregarded by adding to the navigation template, **NOGGA**, **NORMC**, **NOGLL**, and / or **NOVTG** respectively.

In addition, Isis now supports these strings:

VTG // Heading, Speed
ZDA // Date, Time
HDM // Gyro
SHR // Position, Date, Time

D.4.1.3 Real-Time Kinematic

Certain GPS receivers can use a mode known as ***Real-Time Kinematic***, or RTK for short. This RTK mode can measure the antenna height (Height above Geoid) very accurately.

There are at least two methods of transmitting this data to a recording instrument such as Isis. The first is in a modified version of the NMEA0183 **GGA** string; the second is a special string used by Trimble RTK receivers known as a **GGK** string.

Isis stores the altitude information from these strings (if they are present) as Ocean Tide. The priority assigned to the strings is that if a normal **GGA** string and a **GGK** string co-exist, then the altitude information in the **GGK** string will be stored in the XTF file.

The Trimble **GGK** string takes this form:

$PTNL,GGK,023157.00,032800,4740.019328,N,12223.743061,W,1,06, 2.6,EHT53.271,M*55

where the value **EHT53.271** will be saved into OceanTide field in the XTF file. When **GGK** is not present, the **Altitude above Geoid** from the **GGA** message is stored as OceanTide.

D.4.2 Disabling ASCII Reports Produced by NMEA Packets

Some GPS (or Loran) receivers will produce, by default, copious ASCII reports in addition to the standard NMEA0183 packets over the serial interface. These reports can contain receiver diagnostic information, satellite position, and other similar data items. The sheer size of these reports can overload the Isis input buffer and cause the system to work unnecessarily hard as it tries to parse the reports.

Completely disable the GPS ASCII reporting mechanism before using Isis.

In most cases, you can disable the ASCII reports by working through the menus on the front of the GPS receiver. You only want the standard NMEA0183 data packets to go through the serial interface: **$GPGLL**, **$GPGGA**, **$GPZDA**, etc. With the ASCII reporting mechanism disabled, Isis will ignore all **$GPxxx** messages that Isis doesn't specifically parse.

To verify from Isis that ASCII reports aren't being sent by the GPS receiver, use the **Test** button in the Serial Port Setup dialog box to monitor the serial data. You can also monitor serial data from the **com** Port Test submenu found in the Tools menu.

D.5 Special Serial Receive Strings

Except when using NMEA0183 functions, some strings, when received over any active serial port, cause Isis to perform special internal functions (Table D-1).

Table D-1. Special serial receive strings for Isis

String	Meaning of String Function
Event n	Generates an event mark in Isis. When followed by a number, the user can specify the event number. When the Event line is received alone, Isis assigns the next available event number (counting begins at the value specified in the file EVENT.NUM, which Isis checks at startup). The event number is displayed in the Window/Status and Control/Sensors dialog box. A red line will be displayed across the sonar data if enabled in View→Overlay. (Note: This string is not case sensitive.)
NOTE (followed by ASCII string up to 200 characters long)	This causes the following to happen: 1. If plotting is active with annotation of "notes," the string is printed on the plotter. 2. If saving in XTF format, the string is saved into the XTF file. 3. The string is displayed at the bottom of the Parameter display in the "Note" field. (Isis version 2.56 and later)
REPLAY n	Causes Isis to instruct the Target utility to replay a contact. For example, REPLAY 45, when received over any active serial port, causes Target to display contact 45. The template for the com port must be prepared with the token {CONIN} to enable Isis to monitor the serial port for "contact in" instructions; Playback Mode only.

REQUEST_AMPc,n,m,s	This feature returns a string representing a sub-sampled sidescan record. This can be used to inspect the performance of the sonar when operated on a remote system (for example, an AUV). The variables c, n, m, and s mean: **c** = channel bit flags. Bit 0=channel 1, bit 1 = channel 2, etc. **n** = number of samples to return. These will be evenly spaced across the record. **m** = mode. A mode can have a value of 0, 1, or 2: 0=return percentage of max possible signal 1=return percentage of max observed signal on ping/channel **2**=return raw digital values **s** = skip number of center-track samples to skip over when computing the max value used to determine percentage of max observed signal. Example: REQUEST_AMP3,5,2,0... ...returns back over the same serial port a string like: (Chan=0,Min=0,Max=217):0,19,12,24,13 (Chan=1,Min=0,Max=220):0,13,13,3,6 The Min and Max values are the extremes of the digital levels found on the given channels. Sending REQUEST_AMP3,0,0,0 will cause only the Min/Max info to be sent.
REQUEST_FREESPACE	Causes Isis to transmit data back over the same serial port. Data includes total disk space and remaining disk space on the storage volume currently in use.
REQUEST_TEMPLATE	Causes Isis to transmit the template string currently assigned to the given com port back over that com port. This can be used by an external computer to configure data packets for transmission to Isis.
SAVERAW	Causes Isis to log the all data received over a serial port to the XTF file before parsing; Record Mode only. The transmitted strings are time stamped and placed in XTF_HEADER_RAW_SERIAL packets.

START_LOGGING {filename}	Causes Isis to start logging sonar data in record mode. Record mode must have already been started in DISPLAY ONLY mode. When **START_LOGGING** is followed by a fully qualified path and file name, Isis uses that name for saving. Otherwise, Isis generates its own file name.
START_PLOTTING	Causes Isis to turn on the plotter. The plotter must have been already specified in the File/Print dialog box. NMEAO0183 recognizes this too.
STOP_LOGGING	Causes Isis to stop logging and return to DISPLAY ONLY mode; Record Mode only.
STOP_PLOTTING	Causes Isis to turn off plotting.
STOP_PROGRAM	If Isis is in Record Mode, sending this string to Isis will cause Isis to stop recording and then exit. This string is applicable to Windows 95, Windows NT, Windows 2000 or XP operating systems.
STOP_PROGRAM_ SHUTDOWN	If you are running Isis in Record Mode in a Windows NT environment, sending this string to Isis will cause Isis to stop recording, exit, and then power down the computer, if the computer has auto-shutdown capability. This string is applicable to Isis running on a Windows NT, 2000, or XP operating system.

D.6 Transmit Data Format

When a target is logged during an Isis session, pertinent target data can be automatically transmitted out the **com** port on which the navigation data are being received.

To transmit the data format

1. Set up the **com** port with the token **{CONOUT}** to the end of string out of which you want the contact information to go to.
2. Mark the contact by logging a target in Isis (double-click in imagery).
3. Save the contact (press **F9**).

When you do this, pertinent target data are automatically transmitted out the **com** port which was set up in step #1.
The “Contact Digitize” or CD string contains the information shown in Table D-2.

Table D-2. Contact Digitize strings and their meanings

String	Meaning
ccc	contact number. This corresponds to the digits in the file name portion of the currently saved contact. You can use more than three digits in the name.
dd	day of the month, 1… 31
MMM	month of the year, JAN, FEB, …
yyyy	year [four digits]
hh	hour of the day, 00… 23
mm	minute of the hour, 00… 59
ss	second of the minute, 00… 59
ee.e	longitude or eastings (depending on available navigation); longitude is accurate to seven decimal places; eastings are in meters * 10, and therefore will have no decimal point.
nn.n	latitude or northings (depending on available navigation); latitude is accurate to seven decimal places; northings are in meters * 10, and therefore will have no decimal point.
hh.h	heading to tenths of a degree
rr	range in integral meters
tt	contact type, 1…12
ff	sonar carrier frequency in kHz
vol	disk volume label
file	disk file name with drive letter but no extension
pp	ping number

The CD message is comma-delimited, terminated with the line-feed character (ASCII 012), and is transmitted as follows:

CD,ccc,dd MMM 19yy,hh:mm:ss,ee.e,nn.n,hh.h,rr,tt,ff,vol,file,pp

D.7 Logging and Transmitting to a Serial Port

If you have Isis in Record mode, logging can now be controlled via a serial port.

To log to any serial port and transmit:

1. In Isis, turn on serial port (**File→Record Setup→Serial Port Setup**).
2. From the remote system, transmit either of the following strings:

   START_LOGGING ***{optional file name}*** to begin data logging. Isis will create a file name if none is supplied. If you don't provide a path name, Isis uses the path specified in the **Configure→Hypack DDE** dialog box.

   STOP_LOGGING to stop logging but continue displaying data.

Appendix E Using the Target Utility

Target is a software module included with Isis. You use Target to take snapshots of selective areas of your data imagery that may be of special interest to you. When Target takes a snapshot of an image, Target also logs the quantitative data (geocoding, contact mensuration) associated with the image. Thus the image always has a context, a link back to the original data imagery from which the image came.

You can then save these small images as files independent of the original data imagery. You can then recall the image in Isis without having to play back the entire data imagery that contained the selected image—or you can have Isis playback the image in the larger context of your data imagery, in case you want to see the area surrounding the selected image.

E.1 Running Target

You run Target in any of four ways, shown next. Choose a convenient method.

To run Target

- Double-click on the Target icon in the Triton group (Microsoft Windows™), ***or***
- Choose **Target** from the Isis Tools menu, ***or***
- Double-click the left trackball button while imagery is scrolling in a Waterfall window (clicking this way this also puts a contact in the Target working window at the same time), ***or***
- In ROVFlight, select a displayed contact (selected contact is blue) and click on the **Recall Object in Target** button.

However you start Target, the system uses a default **CFG** file name of **TARGET*{new_name}***, where ***{new_name}*** is the name of the local computer. This allows the program to be run from a single network directory to many different workstations, each with its own configuration file.

E.2 Target's File Menu

You use Target's File menu (Figure E-1) to manage contact files. Table E-1 lists the functions.

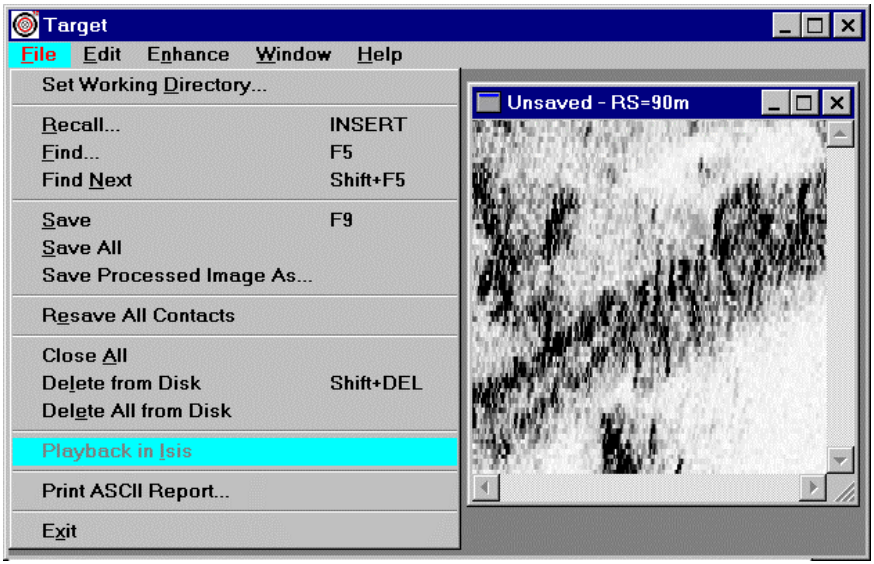


Figure E-1. File menu choices from Target's main menu

Table E-1. File menu choices described

Task Choice	Meaning or Action Performed
Set Working Directory	Use this to specify the directory in which Target will save contacts and look for saved contacts to recall. The definition of the specified directory only lasts for the current session. In Playback Mode, if you don't specify a directory, Target uses the directory that contains the file you opened for playback. In Record Mode, Isis uses the currently active directory for storing contacts if you don't specify a working directory.

Recall (INSERT)	Opens and redisplays the saved images of contacts and targets along with the information associated with the features. Keyboard shortcut: **[INSERT]**. Contacts and targets are stored as individual files with the file extensions **CON** and **TGT** respectively. The features are specified by their assigned numbers (identifiers), which are also the contacts' file names.
Find (F5)	Displays a dialog box used for finding contacts and targets. See Figure E-2 and Table E-2. Keyboard shortcut: **[F5]**.
Find Next (Shift+F5)	Tells Target to get the next target or contact that meets the most recently defined criteria without summoning the Find dialog box (Figure E-2 on page 74).
Save (F9)	After a contact is logged, you can save it to a file on an optical or hard disk using the **Save** command. If the contact has been measured, annotated and / or classified, this information will also be stored with the logged image. When you choose **Save**, the currently selected contact image and information are saved to a file named with the contact number that has been specified using the Set Contact Number command in the Edit menu. The file is saved in the working directory, and the file name extension is either **CON** or **TGT**, depending on the contact rank as specified with the Classify command in the Edit menu. The default file name extension is **CON**. If the mensuration, annotation and / or classification of a saved contact is modified, the **Save** command will cause the old contact information to be overwritten with the new information. Keyboard shortcut: **[F9]**.

Save Processed Image As	Instead of (or in addition to) saving your Target images as CON or TGT files, you can save them in five other formats: 1. PCX image (*.PCX) 2. BMP image (*.BMP) 3. GIF image (*.GIF) 4. JPEG image (*.JPG) 5. TIFF image (*.TIF) ***Note:*** If your images in Target come from data recorded at 16 bits per sample, then the only format you can save to is CON, TGT, or TIFF. If your images come from 8 bits per sample data, then you can save the image in any of the above-listed formats. ***Furthermore, if you intend to save Target images as TIFF files, the following files, or at least copies of them, must reside in the same directory where you keep the Isis executable ISIS.EXE:*** HIFFL32 DLL IFFBMP32 DLL HILCNV32 DLL IFFGIF32 DLL HILENH32 DLL IFFJPG32 DLL HILIMG32 DLL IFFPCX32 DLL HILXFM32 DLL IFFTIF32 DLL

Resave All Contacts	Loads and resaves all contacts in the current working directory. If Isis can find the original files, Isis may update the bookmarks in those files (if **Save bookmarks in original file** had been enabled when the contacts first had been saved).

Close All	Removes all Contact or Target images from the working window and RAM. This does not affect images that already have been saved to your storage medium.
Delete from Disk (Shift+DEL)	Removes a logged contact from your storage medium. A saved contact must be open and be in the window having focus to be deleted in this manner. When you choose **Delete from Disk**, the currently selected contact will be removed permanently from the hard drive or optical drive. Once deleted, it cannot be viewed using the **Recall** command. Keyboard shortcut: **[Shift] [Del]**.
Playback in Isis	Isis looks for the path and file specified in the Contact Information window for the current contact. If the file can be found, a section of the file centered on the contact will be replayed in an Isis waterfall window.
Print ASCII Report…	Saves contact information, in plain text format, of all currently active contacts. See ***'Print ASCII Report'***.
Exit	Ends your Target session.

Note: **CON** and **TGT** images cannot be printed from Isis. To print a **CON** or **TGT** image, save a copy of it in one of the alternative formats listed under **Save Processed Image As** . You can then import the image to another Windows application for further processing or printing. For example, you could save a Target image as a **BMP** image and then open it in Windows Paint or Paintbrush, where you could then edit or print your **BMP** file.

E.2.1 Find

To search the database for contacts or targets that meet certain criteria, use the **Find** command from the File menu. Its dialog box is shown in Figure E-2.

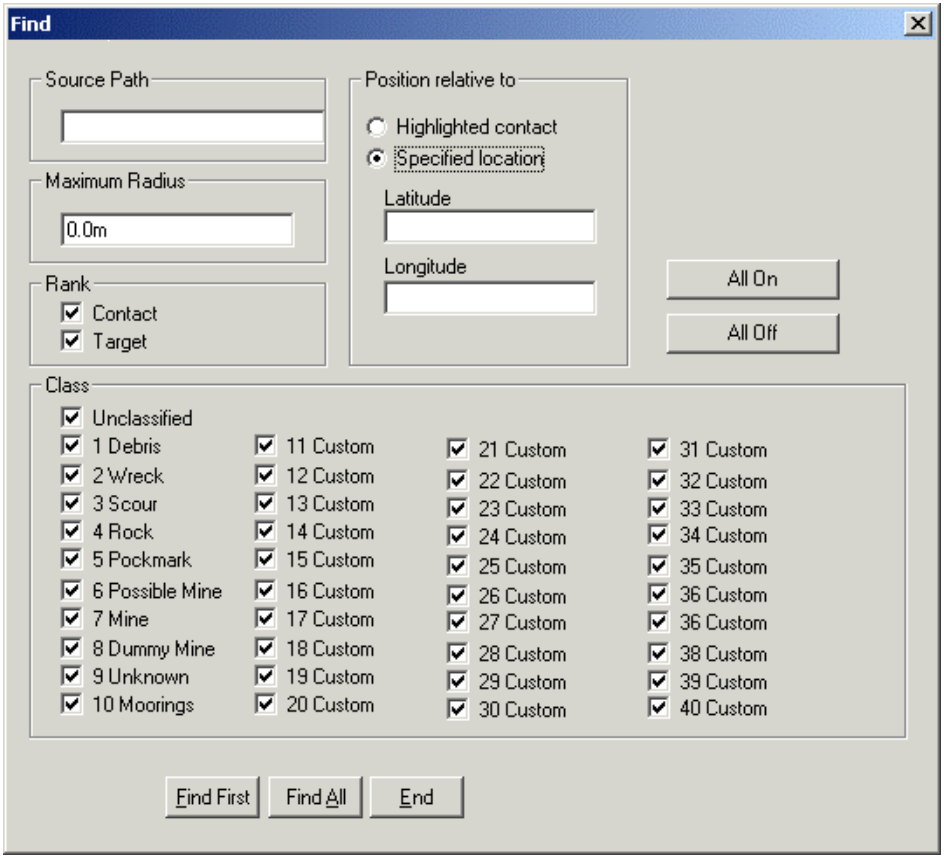


Figure E-2. The Find dialog box

Table E-2 explains the Find dialog box parameters shown in Figure E-2.

Table E-2. Find dialog box parameters and meanings

Option / Area	Meaning
Source Path *(text area)*	Specify the directory in which Target will look for matching contacts. The default path is the working directory (***'Set Working Directory '***).
Position Relative to	Specify the contact currently having the active focus (the **Highlighted contact**) in Target; or, if the **Specified location** radio button is enabled, specify a location based on latitude and longitude that you supply in the latitude and longitude text boxes.
Maximum Radius *(text area)*	Target will search for contacts within a specified radius of the contact currently having the active focus. A radius of **0.0** will prompt Target to consider contacts at any distance from the current contact.
Rank *(check boxes)*	Ask Target to search for contacts, targets or both.
Class *(check boxes)*	Specify which classes of contacts (or targets) that Target will consider in the search.
All On or All Off	When clicked, these buttons turn on or off all the classes listed in the Class panel.
Find First *(button)*	Have Target to load the first contact, matching the specified criteria, that it finds. Once the first contact is loaded, close the Find dialog box and load additional contacts matching the criteria with the Find Next command.
Find All *(button)*	Have Target to load all contacts matching the specified criteria.
End *(button)*	Close the Find dialog box.

E.2.2 Print ASCII Report

Target's **Print ASCII Report** command gives you a way to save contact information, in plain text format, of all currently active contacts. The saved information for all currently selected contacts goes to an ASCII file named **REPORT.TXT** in the current working directory.

The information for your contacts are appended to this report each time you choose **Print ASCII Report.** The information is saved on a LIFO (last in, first out) basis, so that the information for the most recent contact or target appears as the topmost entry in **REPORT.TXT**. After you do **Print ASCII Report** one or more times, you can load **REPORT.TXT** into a text editor to view it, modify it, and print it.

A **REPORT.TXT** file can be terse or quite detailed, depending what parameters you enable or disable in the Print ASCII Report dialog box (Figure E-4 on page 77). Figure E-3 shows the contents of a typical **REPORT.TXT** file.

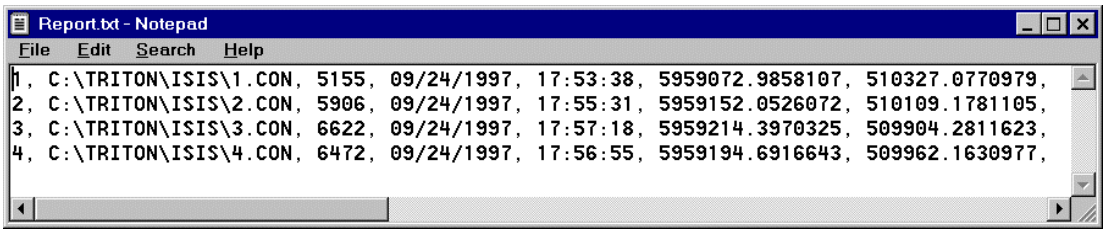


Figure E-3. Sample report of contact information from Print ASCII Report

Note that any lat/lon values appearing in **REPORT.TXT** reflect the position of your pointer in the data imagery when you double-clicked to make the contact image available to Target. To put it another way, the reported Lat/Lon represents the center of your CON or TGT image (not necessarily the center of the data imagery from which your contact image was extracted).

To save a report for one or more open contacts

1. Either:

   - Close all open contacts from the Target utility except for the one(s) whose information you want to append to **REPORT.TXT**.

–or-

- If no contact is present, click on an area in your data imagery to create a new, unsaved contact.

2. From Target's main menu choose **File→Print ASCII Report**.

The system displays a dialog box where you can customize the parameters you want your report to contain. Figure E-4 shows an example of this dialog box.

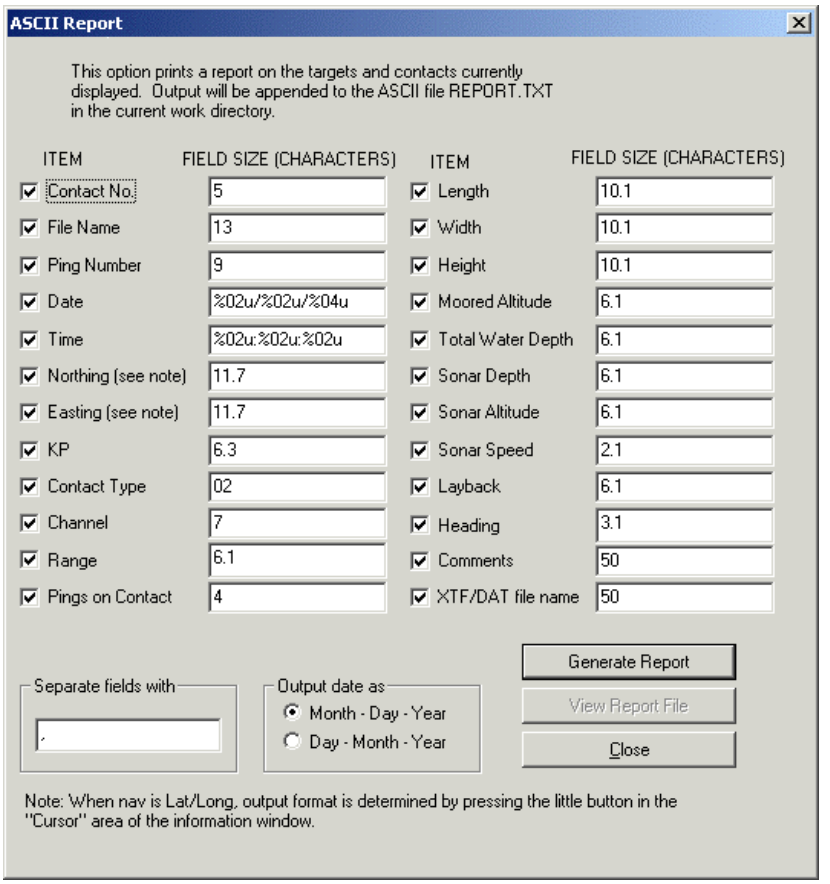


Figure E-4. Print ASCII Report dialog box, with options checked

3. Make your selections by checking or unchecking boxes next to the descriptors and click **OK**.

The information for the currently open contact(s) is appended to **REPORT.TXT** in Target's current working directory.

Note: Recall that, prior to using **Print ASCII Report**, you can specify a different work directory for Target by choosing **File→Set Working Directory**, and then typing the fully qualified directory path. Refer to ***'Set Working Directory… '***.

To create and view the report.txt file in Target

1. Display targets or contacts in the Target working window.
2. From Target's main menu choose **File → Print ASCII Report**.
3. As was the case with the procedure called "x" make your selections by checking or unchecking boxes next to the descriptors.
4. Click **Generate Report**.
5. The system creates **REPORT.TXT**; the previously unavailable (grayed-out) **View Report File** button becomes available.
6. Click **View Report File**.

The system opens **REPORT.TXT** in Notepad, where you can observe the data (an example of the data layout is shown in Figure E-3).

E.3 Target's Edit Menu

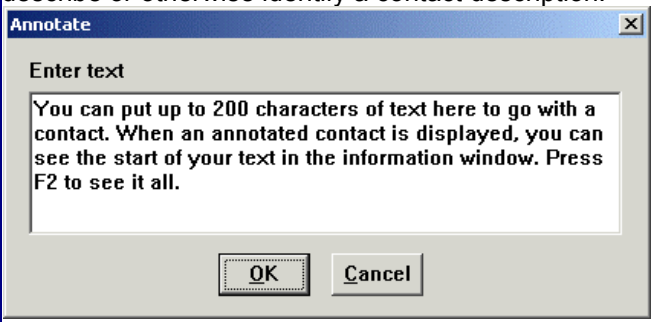
You use Target's Edit menu to do any of these tasks:

- Copy an image to the Clipboard
- Annotate a contact image
- Classify a contact
- Specify the units to use when reporting metrics associated with the file
- Specify whether a mensuration line that is about to be drawn shall be a width, length, or shadow
- Set certain constants

- Set camera parameters
- Set the starting contact number
- Enable or disable speed correction
- Establish RAMP support
- Specify the shape and type of pointer (cursor) to use
- Enable or disable startup with min/max

Table E-3 below explains the options in the Edit menu.

Table E-3. Edit menu choices

Task Choice	Meaning or Action Performed
Copy to Clipboard	Copies an image of your currently selected target to the Windows Clipboard
Annotate… [F2]	Displays a text box where you can add a note to describe or otherwise identify a contact description:  Annotate Enter text You can put up to 200 characters of text here to go with a contact. When an annotated contact is displayed, you can see the start of your text in the information window. Press F2 to see it all. OK Cancel ***Figure E-5. Annotation dialog box***

Classify… [F3]

Displays a dialog box where you can specify the class and rank of the currently displayed feature:

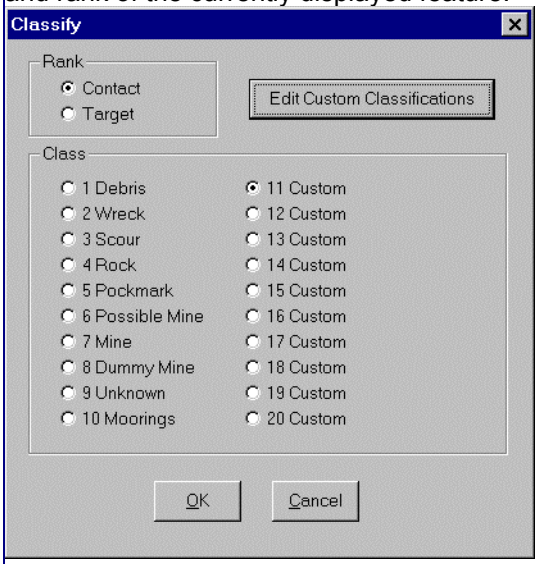


Figure E-6. Classify dialog box

The **Rank** can be Contact or Target. Normally, any feature that is logged is initially ranked as a Contact. When a positive identification is made, the **Rank** of the feature should be changed to Target.

The **Class** of a feature can be any one of 20 descriptors shown above. If you tag a contact with a **Class**, you can later recall your contact images on a **Class** basis, using the **Find** command of Target. Refer to ***'Find'*** for details on this function.

In addition to the ten "canned" classifications offered to you (items 1 through 10, or the leftmost column), you can create your own classifications by clicking on Edit Custom Classifications and providing your own classification name for as many as ten more classifications (items 11 through 20, or the rightmost column).

Units (m, ft, ms)	Determines whether contact quantitative data are listed in meters, feet, or milliseconds. The default is meters.
Next Line Is	These choices aid you in mensurating areas in a contact. • Width: Press **[Alt]-[F1]** to identify the next line you draw as a contact's width. • Length: Press **[Alt]-[F2]** to identify the next line you draw as a contact's length. • Shadow: Press **[Alt]-[F3]** to identify the next line you draw as a contact's shadow. Refer to ***'Contact Logging'*** for a full description of contact mensuration.
Set Constants…	Target uses several constants stored in the imagery data file to calculate the position and dimensions of a contact. These constants include the towfish speed, the towfish heading and heading bias, and the horizontal beam width of the sonar. In addition, if the towfish's position is not stored but the ship's position is stored, Target uses a stored towfish layback to calculate the towfish'es and contact's position. Use the **Set Constants** command to override or modify the values of these constants coming from the imagery data file. Values entered in the **Speed**, **Horizontal Beam Width** and **Fish Layback** boxes will be used by Target in position and size calculations instead of the values stored in the imagery data file. Any value entered in the **Local Variation** box will be used as the towfish'es heading bias and added to the stored heading of the towfish.
Set Camera Parameters…	Allows you to set parameters, including their Fore/Aft, Left/Right, Up/Down offsets, their fields of views, and their altitudes, for up to five cameras to be used with Target.

Set Contact Number…	When a contact is saved using the **Save Contact** command, it is given an identifier and named based on that identifier. The identifier is an integer that you can define with the **Set Contact Number** command. Each time a new contact is saved, the integer currently entered in the **Next Contact Number** field is used as the contact identifier and the **Next Contact Number** is incremented. At any time during Target operation, you can update this number.
Speed Correct	When **Speed Correct** is on, any logged contacts will be transferred to the Target utility with rectilinear images based on the towfish speed. A check mark next to the **Speed Correct** command in the Edit menu indicates that **Speed Correct** is on. Selecting **Speed Correct** again turns it off. The default is off (unchecked).
Ramp Support	If you have Rapid Access Mission Profile support, you can get RAMP files from this dialog box. See ***'RAMP Support (Record/Playback)'*** in the Isis® Sonar User's Manual, Volume 1.
Select Cursor	You can now choose among five different cursor types to use in Target: **Normal Arrow**, **Cross hairs**, **Bull's-eye**, **Gun Scope**, or **Single Dot**.
Startup with Min/Max	**Min/Max** means the image is histogrammed in a certain way: If, say, min/max is set at four percent, then the first four percent of the pixel intensities (black to gray maybe) are set to black. The top four percent (almost white to total white) are set to highest intensity (255 or 65535, depending on whether the image is 8 or 16 bit). Remaining intensities are linearly expanded to fill the range of 0 to max. By default, **Startup with Min/Max** is checked. This means that if an image is loaded which doesn't have an audit trail, then min/max is automatically set at four percent for that image and then displayed with that setting. You can change the min/max setting to a value between one and twenty percent by using the min/max slidebar in the Enhance dialog box (selected from

	Target's main menu). The value 0 means off.

E.4 Contact Logging

Contacts are logged from within Isis by double-clicking with the left trackball button on an image of the contact as viewed in a waterfall window. A full-resolution image of the contact along with critical geocoding information is transferred to the Target utility where you can save it, with or without measuring it first. (See ***'Contact Mensuration'*** and ***'Save (F9)'.)***

You can define the size of the transferred image through the **Target Setup** command in the Tools menu of Isis. Ranges are 64 by 64 pixels, up to 2048 by 2048 pixels. The default size is 256 by 256 pixels.

E.4.1 Contact Information

When a contact is transferred to Target, a Contact Information window is displayed. Some of this information is transferred directly from Isis, and some is calculated within Target. Figure E-7 shows a typical Contact Information window with a contact's statistics:

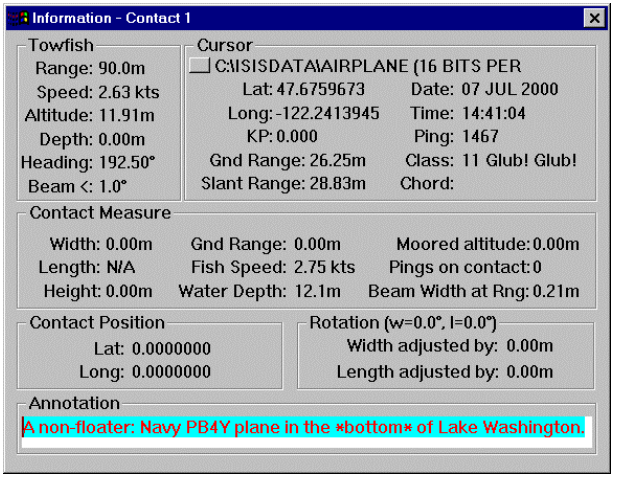
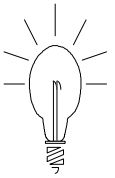


Figure E-7. Contact Information window for a sample contact

Table E-4 explains the parameters for the Contact information window.

Table E-4. Contact information parameters

Towfish	Towfish attitude information for the ping associated with the center of the contact. This information is used by Isis in geocoding and contact mensuration.
Cursor	The last requested cursor position within the contact image. A cursor position is requested by clicking with the left trackball button. If navigation data have been transmitted to Isis as latitude and longitude, the button in the upper left corner of this box provides a three-way toggle for displaying position in decimal degrees, degrees and decimal minutes, or degrees, minutes and decimal seconds. Also included in the cursor box is the contact classification (meaning class or type) if one has been specified and the chord or distance between any two points in two different contact images.
Contact Measure	When a contact is transferred from Isis to Target, the position of the contact is given in the Contact Measure box. This position is modified whenever the contact is measured or when the measurement is modified. (See ***'Contact Mensuration'***.)
Contact Position	This is the position of the contact if you mensurate it. See the discussion in the section ***'Contact Mensuration'***.
Annotation	Notes you enter with the **Annotate** command.



To measure the distance between two logged contacts, display both contact images and use the left trackball button to drag out a line between the two contacts. ***The distance will be displayed as the Chord in the Contact Information window.***

E.4.2 Contact Mensuration

When you have an image of your contact in Target, you can measure, or ***mensurate***, it in three dimensions: width (across track), length (along track), and height (also along track). A contact's width is always measured across-track (the abscissa vector); its length is measured along-track (the ordinate vector). The implication of this rule is that an object's narrowness or fatness does not necessarily translate as width or length when you are mensurating it. For example, if your contact is a ship lying across-track in your imagery, the ship's width is measured along the bow-to-stern direction. That same ship's length is measured from its fattest distance (usually amidships) in the side-to-side direction: port to starboard or starboard to port, in this example.

If an object has any significant height, it casts a shadow. When a shadow is present, Target can calculate an object's height from its shadow. Look for the shadow to the outside of the contact. The shadow is to the left of the contact for a port channel and to the right of the contact for a starboard channel. A negative range in the Cursor box of the Contact Information window indicates a port-side image and a positive range indicates a starboard-side image. A separation of the shadow from the contact indicates that the contact is moored; in such a case Isis will calculate the moored altitude based on this separation.

Isis takes a contact's measurements in the following order: width before length before height. (Isis uses these distances along with towfish position, towfish attitude and sonar beam width to calculate the contact position and size.) Accordingly, you mensurate your contact in width-length-height order.

To mensurate a contact's width

1. Position your trackball's pointer at the left or right edge of the contact.
2. Hold down the left trackball button and rotate the trackball to draw a line across the contact's width (across track).
3. Release the left button when you have completed the line.
4. Target displays a magenta line spanning the contact's width.

Always measure the width of a contact before measuring the width of the contact shadow.

To mensurate a contact's length

1. Position your trackball's pointer at the top or bottom edge of the contact.
2. Hold down the left trackball button and rotate the trackball to draw a line through the contact's length (along track).
3. Release the left button when you have completed the line.
4. Target displays a magenta line spanning the contact's length.

To mensurate a contact's height when a shadow is present

1. Find the contact's shadow.
2. Observe and position your trackball's pointer at the left or right edge of the shadow.

3. Hold down the left trackball button and rotate the trackball to draw a line through the contact's shadow (across track).
4. Release the left button when you have completed the line.
5. Target displays a cyan line spanning the contact's shadow.

Note: If your line for the shadow is ***magenta***, not ***cyan***, then Target has interpreted your shadow line as the contact's width. That is because your width line and your shadow line overlap by an imaginary line in the vertical dimension. You need to redraw the shadow line so that the width and shadow lines do not overlap.

If no shadow is present, you cannot measure the contact's height.

To remove lines in an unsaved, mensurated contact

1. Double-click with the left trackball button anywhere in the contact.

   Each time you double-click, a line is removed.

2. Continue to double-click until all unwanted lines are removed.

   This action also clears the information from the Contact Measure box of the contact information window.

A typical mensurated contact might look like the sample shown in Figure E-8.

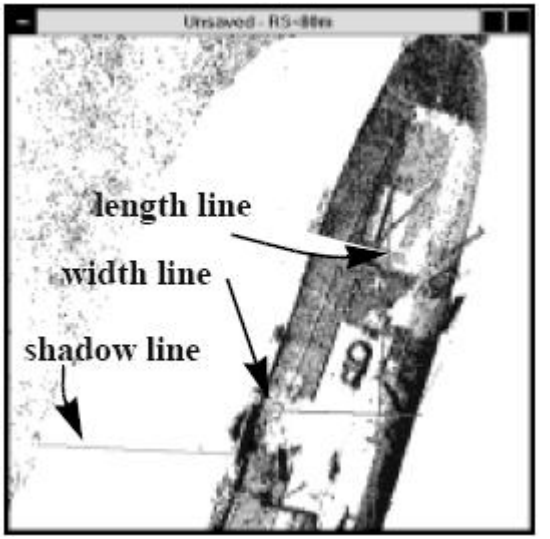


Figure E-8. Mensuration lines on a contact image

Whether or not you have mensurated the contact, you can save the contact at any time by pressing the **[F9]** key or selecting **Save Contact** from the File menu.

Contact files are not named or saved to the hard disk until Save Contact has been selected.

E.5 The Enhance Function

In Enhance you can:

- Increase or decrease brightness, contrast, gamma, and sharpness in an image;
- Emphasize or de-emphasize content in the image using 14 unique "filters";
- Apply three different kinds of vignette lighting corrections to an image;
- Rotate the image clockwise or counterclockwise;
- Magnify the image three different ways (replicate, bilinear, or cubic sampling).

You preview your enhancements in Enhance before applying your changes to your Target contact image.

If an image does not have Tag 270 information, you still will be able to load the image into Enhance, but you will not be able to mensurate the image.

To use Target's Enhance function

1. Load a TIFF image into Target (**File →Recall** or press **[Insert]**).

   The system displays a dialog box where you can type a file name. You can also browse for the TIFF file by clicking **Display Menu** in this dialog box. The system displays the TIFF image and an Information window with data pertaining to the image.

2. From Target's main menu select **Enhance**.

   The system displays the Enhance dialog box. Figure E-9 shows a typical Enhance dialog box with four enhancements applied to a thumbnail of an image loaded into Target. If your thumbnail enhancements display the effect you seek, you can then apply your thumbnail enhancements to the larger file you loaded in step 1.

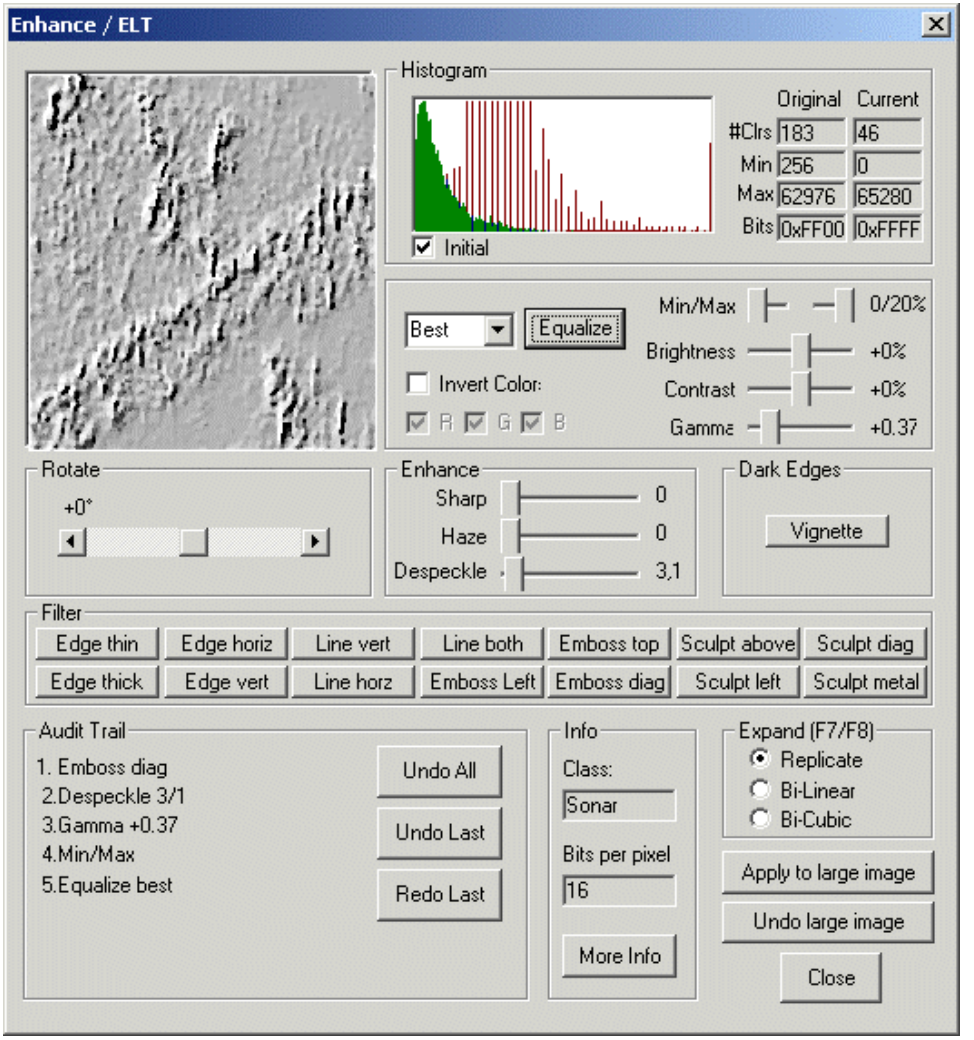


Figure E-9. The Enhance dialog box

The options available in the Enhance dialog box are explained in Table E-5.

Table E-5. Enhance functions in the Enhance dialog box

Option / Area	Meaning
Histogram *(area)*	• **Initial** (check box): Graphs the dynamic range distribution of the image's colors for the current image (enhanced or not). Thereafter, each instance of a modified image is graphically superimposed (layered) in the histogram window if **Initial** remains checked. If it is unchecked, then the histogram just shows the latest enhancement performed. Colors in the histogram can be red, green, and/or blue. • **G** (green): This represents the original color as loaded from disk before any processing enhancements are applied (same as "original" column of histogram). • **R** (red): This represents the image after all processing steps are applied. • **B** (blue): When blue is present, it represents the intersection of red and blue colors. Therefore, it defines the area of the image where original and processed colors completely overlap. • To the right of the histogram are two columns labeled Original and Current. **Original** means those values that are present in the original image before any processing occurs in Enhance/ELT. **Current** means those values that are present in the current image based on the enhancements performed so far on the thumbnail.

Histogram *(area, continued)*	Original and Current track four parameters: **#Clrs**, **Min**, **Max**, and **Bits**. • **#Clrs** — These are the number of unique pixel values in the image. • **Min** and **Max** — These are the lowest and highest pixel values found in the image, respectively. See page 83 for a more detailed discussion of min/max. • **Bits** — These are the number of bits of all of the data in the contact window, logicalled OR'd together and expressed in hexadecimal notation, that are present in the image. For example: **0x7FF8 = (0 1 1 1 1 1 1 1 1 1 1 1 0 0 0) binary** **0x7F80 = (0 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0) binary** The most-significant bit is always zero because the data will always be unsigned. The unused bits, marked with x's above, will normally be set to zero. When you crop an area of interest in the Target image to work with in Enhance, histograms pertain just to the cropped area.

Equalize *(button)*	Equalize manipulates the dynamic range of the colors in the image. The choices in the drop-down box are: • **None**: No equalization is applied to the image. • **Best**: Enhance attempts to do a "best fit" of the range of colors in the image based on shadows and highlights. The bottom 3% of the range is defined as a shadow point, while the top 3% of the range is defined as a highlight; then all remaining values in between shadows and highlights are evenly distributed throughout the range. • **Linear**: All values are distributed equally throughout the range. • **Bell**: All values are distributed evenly around the center of the scale. This produces a high contrast image, but one with a more limited dynamic range than an image enhanced by Linear equalization. • **Logarithmic**: Favors (skews) the values toward the low end of the scale, effectively making the image darker with greater contrast. The dynamic range of the colors is compressed (squashed). • **Exponential**: Favors (skews) the values toward the high end of the scale, effectively making the image lighter with less contrast. As with **Logarithmic**, the dynamic range of the colors is compressed.
Invert Colors *(check box)*	If checked, all colors are reversed: White becomes black, black becomes white, etc. The primary colors red, green and blue can be inverted independently of one another by putting a check mark in any of the **R**, **G**, or **B** box or boxes.
Min/Max *(slider bar)*	See page 83 for a discussion of min/max effects.
Brightness *(slider bar)*	Sliding the bar to the right brightens the image; sliding it to the left darkens it. When the bar is at the midpoint (+0%), the image has neutral brightness (no change in brightness). Range is -100% (dimmest) to +100% (brightest).
Contrast *(slider bar)*	Sliding the bar to the right increases the image's contrast; sliding it to the left decreases it. When the bar is at the midpoint (+0%), the image has neutral contrast (no change in contrast). Range is -100% (least contrast) to +100% (most contrast).

Gamma *(slider bar)*	Gamma is a way of logarithmically compensating for low intensity pixels that may be present in some images. Sliding the bar to the right increases the gamma index for the image (maximum gamma = +10); sliding it to the left decreases it (minimum gamma = +0.10). The value +1.00 represents midpoint of the scale (no gamma).
Rotate *(slider bar)*	Sliding the bar to the right rotates the image clockwise (0° to 180°); sliding the bar left rotates it counterclockwise (-1° to -179°). Although you see the rotated image in the thumbnail window, the rotation in the Target image does not take effect until **Apply Rotate** is clicked.
Sharp *(slider bar)*	Sliding the bar to the right increases sharpness (emphasizes fine edges in the image). The bar initially is at the left and displays a value of 0, indicating no sharpness is being applied. Maximum sharpness is achieved when the bar is all the way to the right and displays a value of 30. (The units are just relative and are not meant to suggest any mathematically based values.)
Haze *(slider bar)*	Sliding the bar to the right increases haze (blurs or de-emphasizes fine edges in the image). The bar initially is at the left and displays a value of 0, indicating no haze is being applied. Maximum haze (blur) is achieved when the bar is all the way to the right and displays a value of 10.

Despeckle *(slider bar)*	Removes “noise” from the image. Noise is defined as any pixel that exceeds the median kernel value as defined by a median kernel cell size and a sensitivity value. The median kernel cell size can have values of 3, 5 or 7. Sensitivity is the number used to determine how different the center pixel in the image region must be before the pixel is replaced by the region's median value. During despeckling, the image is examined in CellSize x CellSize regions. The value in the center pixel is compared to the median value for that region. If the difference between the center value and the median value exceeds the value specified on the Despeckle bar, the center pixel is replaced with the median value. Otherwise, the center pixel keeps its original value. Every pixel in the image is analyzed in this way.
Vignette Lighting *(radio buttons)*	Vignette lighting compensates for large variations of light (or lack of it) in the background of the image. When vignetting is applied, points furthest from the center of the image are darkest, and points closest to the center are lightest.

Filter *(buttons)*	Enhance has 14 distinct filters for changing the look of your Target image. You can use them singly or in combination; that is, filtering effects are cumulative to the thumbnail image, unless you click **Undo Last** or **Undo All** before applying another filter. The filters are: • **Edge thin**: Highlights the edges of an image using a thin line. • **Edge thick**: Highlights the edges of an image using a thick line. • **Edge horiz**: Accents the horizontal edges and de-emphasizes all other parts of the image. • **Edge vert**: Accents the vertical edges and de-emphasizes all other parts of the image. • **Line vert**: Accentuates vertical lines and de-emphasizes all other parts of the image. • **Line horz**: Accentuates horizontal lines and de-emphasizes all other parts of the image. • **Line Both**: Accentuates vertical and horizontal lines and de-emphasizes all other parts of the image. • **Emboss Left**: Produces an image with an embossed look with light source from left side. • **Emboss top**: Produces an image with an embossed look with light source from above. • **Emboss diag**: Produces an image with an embossed look with light source from upper left corner. • **Sculpt above**: Produces an image with a sculpted look with light source from above. • **Sculpt left**: Produces an image with a sculpted look with light source from left side. • **Sculpt diag**: Produces an image with a sculpted look with light source from upper left corner. • **Sculpt metal**: Produces an image with a shiny, metallic look.

Audit Trail *(area)*	Every time you make a proposed enhancement to your image, the Enhance function records your action and displays it here as a line of text. The line items are sequentially numbered to show you the order in which you entered your proposed enhancements. • **Undo All** (button): This undoes all enhancements to the thumbnail image applied in this session. Visually, the thumbnail returns to its original state (cropped or uncropped). **Undo All** does not affect any changes that you already may have made to the larger Target contact image. Compare to **Undo Large Image** later in this table. • **Undo Last** (button): This undoes the last enhancement change applied in this session. Each time you left-click, the most recently entered enhancement is removed from the list and from the image. Any other enhancements that may have been done to the thumbnail image in this session is not affected. • **Redo Last** (button): Reverses the action of an **Undo Last**. You also can undo any enhancement from the numbered list, without regard to its order in the list, by double-clicking on the enhancement. As you do, the action is removed from the list.
Apply All *(button)*	Clicking this button causes all enhancements done to the image in this session to take effect in the larger image (the parent image of the thumbnail) loaded into Target.

Information *(area)*

Clicking **More Info** displays the Information dialog box (Figure E-5). The data in the top six fields comes directly from the image. These fields are not editable.

- **Class** (field): Gray Scale or Color.
- **Bits per Pixel** (field): Bits per Pixel.
- **More Info** (button): Clicking this button displays a dialog box similar to the one shown in Figure E-5.

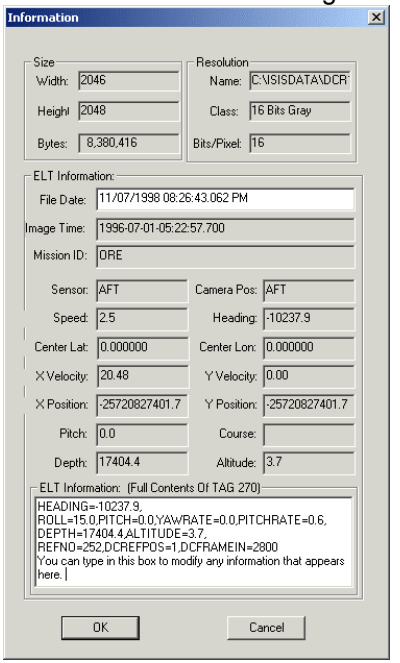


Figure E-10. Information dialog box from 'More Info' button

Although you cannot modify the **Size** and **Resolution** data in Enhance, you can modify the text in the **ELT Information** area. Any changes (such as the text shown circled in Figure E-10) are written back to the TAG270 file if you save it in Target.

Expand *(radio buttons)*	Just as you can expand or reduce an image in Target, so can you expand (zoom in) or reduce (zoom out) on an image from the Enhance dialog box. In Enhance, zooming can take one of three forms: replicate, bilinear, or cubic. • **Replicate**: The image is interpolated and magnified linearly. Original pixels values are replicated. • **Bilinear**: This kind of zooming takes into consideration a 2x2 neighborhood of pixels about a point. • **Cubic**: This kind of zooming takes into consideration a 4x4 neighborhood of pixels about a point.
Apply to large image *(button)*	The current set of enhancements you did on the thumbnail image is applied to the image you loaded into Target.
Undo large image *(button)*	**Undo large image** undoes all enhancements to both the thumbnail image and the Target contact image done in this session. However, because **Undo large image** does not remove the unenhanced thumbnail image from the thumbnail viewing area, you can use the current thumbnail image (now cleared of enhancements) as the template upon which you can impose a new set of enhancements. **Undo large image** does not uncrop a cropped image (right-click in the Target contact image to do that). Compare to **Undo All** earlier in this table.
Close *(button)*	Exits the Enhance utility but not the Target utility.

By cropping your Target contact, you can work with a small part of your image just as easily as you can work with the whole image. Enhance has a built-in tool for doing that.

To crop a part of a Target image and preview it in Enhance

1. Click in the Target image to make Target your active window.
2. From Target's main menu, click on **Enhance** to open the Enhance dialog box.
3. Because you will be "drawing" a square around your area of interest, visualize a corner of the area of interest to you in the Target contact and put your insertion point there.
4. In the larger, original image (in other words, outside the Enhance dialog box) press and hold the right trackball button.
5. While continuing to hold and press the right trackball button, use the trackball to move your insertion point to an imaginary corner opposite your current position.
6. Release the right button.

The system outlines the area you have cropped with a white square. This cropped image now occupies all of the thumbnail area in the Enhance dialog box. You can now make one or more enhancements to the cropped image in Enhance.

To uncrop a cropped image appearing in Enhance

Right-click in the Target contact image.
The system displays a thumbnail of the entire Target contact image (with or without enhancements) in the Enhance dialog box.

E.6 Target's Window Menu

You use Target's Window menu (Figure E-11 on page 100) to resize the images in your Target windows and to reposition the windows themselves, as desired.

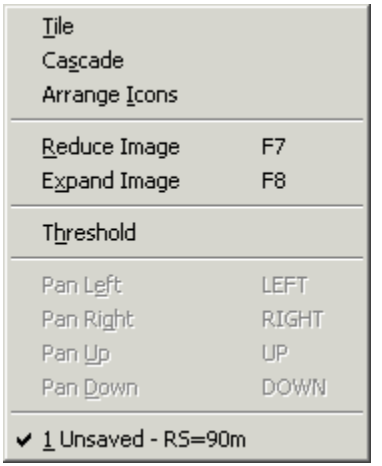


Figure E-11. Target's Window menu and its submenus

E.6.1 Tile, Cascade, Arrange Icons, Close All

The commands in this group are standard Microsoft Windows commands. Refer to your ***Getting Started with Microsoft Windows*** manual if you need help with these commands.

E.6.2 Reduce Image and Expand Image

You can zoom in on a logged contact by using the **Expand Image** command from Target's Window menu. After an image has been expanded by zooming in, you can zoom out again to reduce the image size. You use the **Reduce Image** command from Target's Window menu to zoom back out. The keyboard shortcuts are **[F8]** to expand (zoom in) and **[F7]** to reduce (zoom out).

Using pixel replication, the scale can be magnified between no magnification (1x, which is the initial and default scale) and 16 times (16x) the current scale. When the contact image is displayed at an expanded scale, the scale of the image is indicated in the upper left corner of the window.

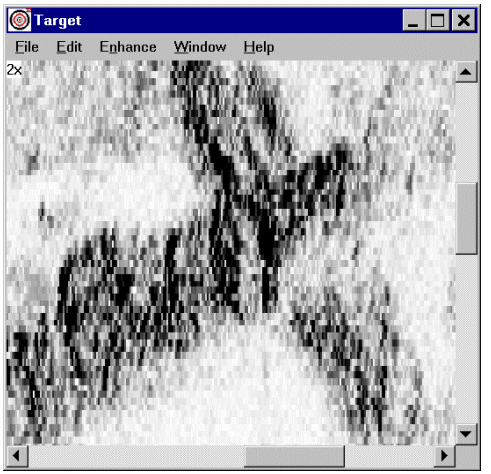


Figure E-12. A contact image expanded twice its original size

Figure E-13. Same image reduced to one-third its original size

E.6.3 Threshold

The Threshold slide bar allows you to adjust the level of contrast stretching. When the box is positioned at the left side of the bar, no thresholding is applied. Maximum thresholding is applied when the box is at the right side of the bar. If you put a check mark in the **Reverse Colors** box, the colors reverse. The Threshold window can also be summoned by right-clicking on the contact in Target.

E.6.4 Pan Left, Right, Up or Down

When a contact image is displayed at an expanded scale (any scale other than 1x), the window remains the same size and only a portion of the image is visible at any one time. Use the Pan commands to move the window over the expanded image. The arrow keys provide keyboard shortcuts for the four pan keys.

When a measurement is made in an expanded image, the display window is automatically centered on that measurement.

E.7 Format of TGT and CON Files

The TGT and CON types of files of the Target utility are identical in format and are composed of four types of records, or structures:

- a structure that gives the Target utility 16-bit and 32-bit compatibility
- a header structure (cinfo)
- an image structure, and
- a telemetry structure (telemetry)

That format is shown in Table E-7. Varieties of data types are used to represent the structural elements according to the purpose of the elements. The programming conventions used to represent the various data types are the same as those used for the XTF format (Appendix D).

E.7.1 WPOINT: A Structure for Bridging Back to 16-Bit Systems

The Target utility originally was designed to run on 16-bit Windows systems. With the emergence of 32-bit systems, Target was upgraded to run on these newer systems. At the same time, Target has maintained its backward compatibility with the 16-bit systems by including a programming structure identified to Target as ***wpoint*** (Table E-6).

Table E-6. The WPOINT structure for a TGT or CON file

Structure's Element Name	Bytes Used	Data Type	Remarks, Values, Ranges, Examples, etc.
total bytes used for this structure: 4			
X	2	SHORT	for backward compatibility
Y	2	SHORT	for backward compatibility

E.7.2 CINFO: Channel Information Header Structure

The header structure for channel information appears in Table E-7.

Table E-7. The CINFO header structure in a TGT or CON file

Structure's Element Name	Byte offset	Data Type	Remarks, Values, Ranges, Examples, etc.
total bytes used for this structure: 1024			
StructureVersion	0	WORD	Version for the CINFO structure 100 = Version 1.00 (old CINFO) 101 = Version 1.01 102 = 1.02 (current CINFO version)
Cinfo_size	2	WORD	Size of the CINFO structure (1024 bytes)

Telem_size	4	WORD	Size of the TELEMETRY structure
Rank	6	SHORT	0=contact, 1=target
Classification	8	SHORT	Typically 1-10, user-defined to help distinguish object data type
ContactNumber	10	DWORD	
OriginalSourceFileName[256]	14	CHAR	Original DAT or SEG file name
PingNumber	270	DWORD	Ping number of center of target
Channel	274	WORD	Channel number for logged contact
TypeOfChannel	276	WORD	Subbottom, port or starboard
PixelIndex	278	WORD	Pixel number of the click point
FixedVSOP	280	FLOAT	Fixed vertical size of pixel in cm.
Day	284	BYTE	Annotation day
Month	285	BYTE	Annotation month
Year	286	WORD	Annotation year
Hour	288	BYTE	Annotation hour
Minute	289	BYTE	Annotation minute
Second	290	BYTE	Annotation second
hSecond	291	BYTE	Annotation millisecond
FishHeading	292	FLOAT	Attitude values at point where contact was digitized
FishSpeed	296	FLOAT	Speed of tow fish in knots
FishDepth	300	FLOAT	Distance from sea surface to tow fish
FishAlt	304	FLOAT	Distance from tow fish to seafloor
OceanTide	308	FLOAT	Ocean tide in meters
FishLayback	312	FLOAT	Distance over ground from ship to fish
BeamWidth	316	FLOAT	3dB beam width; typically 50 degrees
Pings_Per_Second	320	FLOAT	
ContactSlantRange	324	FLOAT	<0 for port, >0 for starboard
SamplesPerChannel	328	WORD	Samples per channel in original

			file
wNavUnits	330	WORD	0=meters; 3=degrees
PositionY	332	DOUBLE	Latitude or northing
PositionX	340	DOUBLE	Longitude or easting
BitmapWidth	348	WORD	Width of bitmap in pixels
BitmapHeight	350	WORD	Height of bitmap in pixels. Note that display height can be different than bitmap height.
wThreshold	352	WORD	Value stored from Isis
wShift	354	WORD	Value stored from Isis. Original data value shifted right by wShift value.
All remaining values that follow are specific to Target and aren't used in Isis:			
ChannelRange	356	FLOAT	Range of this channel
LeftEdgeSample	360	WORD	Sample index of the left side of the bitmap
RightEdgeSample	362	WORD	Sample index of the right side of the bitmap
EchoAcrossP1	364	WPOINT	Defines the points of the echo and shadow across track and along track
EchoAcrossP2	368	WPOINT	Defines the points of the echo and shadow across track and along track
EchoAcrossP1Index	372	SHORT	Defines the points of the echo and shadow across track and along track
EchoAcrossp2Index	374	SHORT	Defines the points of the echo and shadow across track and along track
EchoAcrossP1Crange	376	DOUBLE	Defines the points of the echo and shadow across track and along track
EchoAcrossP2Crange	384	DOUBLE	Defines the points of the echo

			and shadow across track and along track
EchoAlongP1	392	WPOINT	Defines the points of the echo and shadow across track and along track
EchoAlongP2	396	WPOINT	Defines the points of the echo and shadow across track and along track
EchoAlongP1Index	400	SHORT	Defines the points of the echo and shadow across track and along track
EchoAlongp2index	402	SHORT	Defines the points of the echo and shadow across track and along track
EchoAlongp1Crange	404	DOUBLE	Defines the points of the echo and shadow across track and along track
EchoAlongp2Crange	412	DOUBLE	Defines the points of the echo and shadow across track and along track
ShadowAcrossP1	420	WPOINT	Defines the points of the echo and shadow across track and along track
ShadowAcrossP2	424	WPOINT	Defines the points of the echo and shadow across track and along track
ShadowAcrossP1index	428	SHORT	Defines the points of the echo and shadow across track and along track
ShadowAcrossP2index	430	SHORT	Defines the points of the echo and shadow across track and along track
ShadowAcrossP1Crange	432	DOUBLE	Defines the points of the echo and shadow across track and along track
ShadowAcrossP2Crange	440	DOUBLE	Defines the points of the echo and shadow across track and along track
NewPositionY	448	DOUBLE	Corrected position computed with the measure function

NewPositionX	456	DOUBLE	Corrected position computed with the measure function
ComputedLength	464	DOUBLE	Along track
ComputedWidth	472	DOUBLE	Across track
ComputedHeight	480	DOUBLE	Computed height of object above the seabed
ComputedDepth	488	DOUBLE	Depth computed from latitude and pressure
ComputedMooredAltitude	496	DOUBLE	Altitude of object from bottom
NumPingsOnContact	504	WORD	Total pings for contact
ContactIndex	506	DWORD	Index into the contacts.bin file
ExpandFactor	510	SHORT	How much to enlarge the image in a multiple document interface window
ExpandCenterX	512	WORD	Center of the expand X
ExpandCenterY	514	WORD	Center of the expand Y
AssignedPositionX	516	DOUBLE	Assigned position used to set contact pos from RovFlite
AssignedPositionY	524	DOUBLE	Assigned position used to set contact pos from RovFlite
KP	532	FLOAT	Kilometers of pipe
wBitsPerPixel	538	WORD	How many bits (8 or 16)?
LastClickPoint	542	WPOINT	Preserves where the user last clicked for updating the **Cursor** section of the info dialog box
CorrectedChannelFlags	546	DWORD	If bit 0 is set to 1, channel 0 has already been slant-range corrected.
ChannelBoundaryOffset	548	WORD	Used to track a bitmap crossing a channel boundary
RampFileUsed	550	WORD	0 = not used; 1 = fish; 2 = ship
ContactType	552	WORD	0 = normal sonar image; 1 = polygon points; 2 = ESC image
DisplayUnits	554	WORD	0 = meters; 1 = feet; 2 = milliseconds
TimeOffTrack	562	DOUBLE	Seconds, time off track to the contact

ContactGroundRange	566	FLOAT	Ground range to the contact
unassigned[2]	568	CHAR	Unused
InternalFileName[248]	816	CHAR	Internal use (passing .CON/.TGT file name from Target to Isis)
FishPitch	820	FLOAT	Pitch in degrees (positive = nose up)
FishRoll	824	FLOAT	Roll in degrees (positive = roll to stbd)

E.7.3 The Image Structure

Bitmap bits (BitmapWidth • BitmapHeight • BitsPerPixel/8) bytes. Each 8-bit byte (0…255 for 8-bit data, -32768… +32767 for 16-bit data) is related to sonar input voltage linearly from 0… +5 volts or –5… +5 volts, respectively. A zero is always a low return, and the more negative or positive a value gets, the stronger the acoustic echo.

E.7.4 Telemetry Structure

Target also uses a structure called Telemetry. Shown in Table E-8, the structure keeps track of the telemetry information for each ping. The number of pings is equal to the height. The total number of bytes for this entity is BitmapHeight * sizeof(***telemetry***). With this data, Target has detailed information about every pixel in the image.

Don't change the size of this structure —
or else you won't be able to play back old contacts!

Table E-8. The TELEMETRY structure for a TGT or CON file

Structure's Element Name	Bytes offset	Data Type	Remarks, Values, Ranges, Examples, etc.
total bytes used for this structure: 89			
Day	0	UCHAR	Annotation day
Month	1	UCHAR	Annotation month
Hour	2	UCHAR	Annotation hour
Minute	3	UCHAR	Annotation minute
Second	4	UCHAR	Annotation second
Hsec	5	UCHAR	Annotation millisecond
NavHour	6	UCHAR	Hour from Nav clock
NavMinute	7	UCHAR	Minute from Nav clock
NavSecond	8	UCHAR	Second from Nav clock
Year	9	WORD	Year from Nav clock
Ycoord	11	DOUBLE	Northing or Latitude
Xcoord	19	DOUBLE	Easting or Longitude
FishSpeed	27	FLOAT	Speed of tow fish in knots
FishHeading	31	FLOAT	Fish heading in degrees
FishLayback	35	FLOAT	Distance over ground from ship to fish
FishDepth	39	FLOAT	Distance from sea surface to tow fish
OceanTide	43	FLOAT	Ocean tide in meters
FishAlt	47	FLOAT	Distance from tow fish to seafloor
PingNumber	51	ULONG	
EventNumber	55	SHORT	Usually assigned to contact by outside source

Range	57	FLOAT	Range scale of the ping
DelayRecording	61	DOUBLE	In ms, time from transmit to beginning of the first pixel
TelemFishPitch	69	FLOAT	Roll in degrees (positive = roll to stbd)
TelemFishRoll	73	FLOAT	Pitch in degrees (positive = nose up)
KP	77	FLOAT	Kilometers of pipe
SecondsPerPing	81	DOUBLE	

Appendix F Working with Signal Interfaces

Isis works with more than one type of signal interface unit (SIU). This interface, simply called an SIU interface in this section, is an external module to Q-MIPS and Isis. As such, the SIU acts as a conduit between the detected analog side-scan sonar, sub-bottom profiler, boomer, or tape-playback signal, and the Q-MIPS or Isis analog input. The latest type of signal interface unit is the SIU5. It was preceded by is the SIU4-2 and SIU4 models. Other prominent interfaces addressed in this section are the interfaces for the Simrad 992, the Klein 595, and the Klein System 2000 digital sonars.

F.1 Signal Interface Unit 5 (SIU5)

The SIU5 and its cables are depicted in Figure F-1.

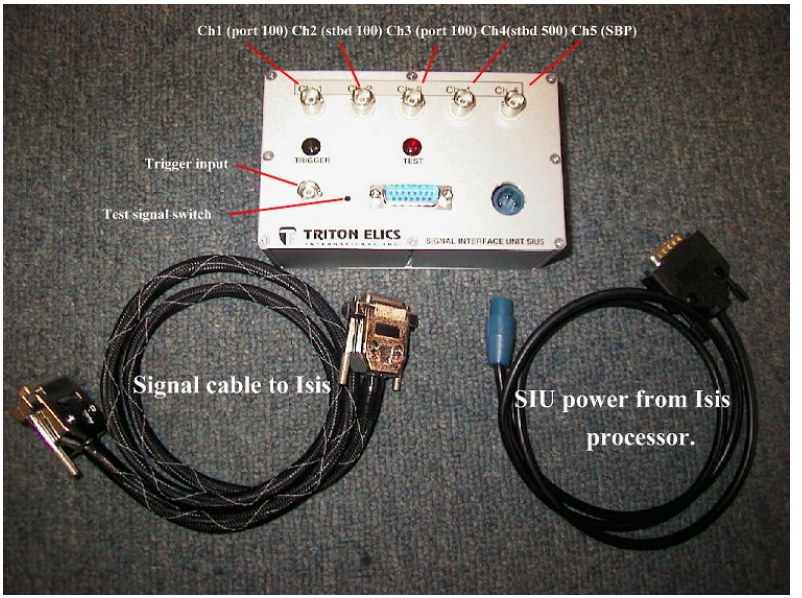

Ch1 (port 100) Ch2 (stbd 100) Ch3 (port 100) Ch4(stbd 500) Ch5 (SBP)
Trigger input
Test signal switch
TRITON ELICS
SIGNAL INTERFACE UNIT SIU5
Signal cable to Isis
SIU power from Isis processor.

Figure F-1. SIU5 interface box and cables

The back (bottom) of the SIU5 has a diagram of the box's functions shown in Figure F-2. The channel points, trigger port, signal cable port, and power port are all receptacles for cables that attach the SIU5 to your PC and to your sonar.

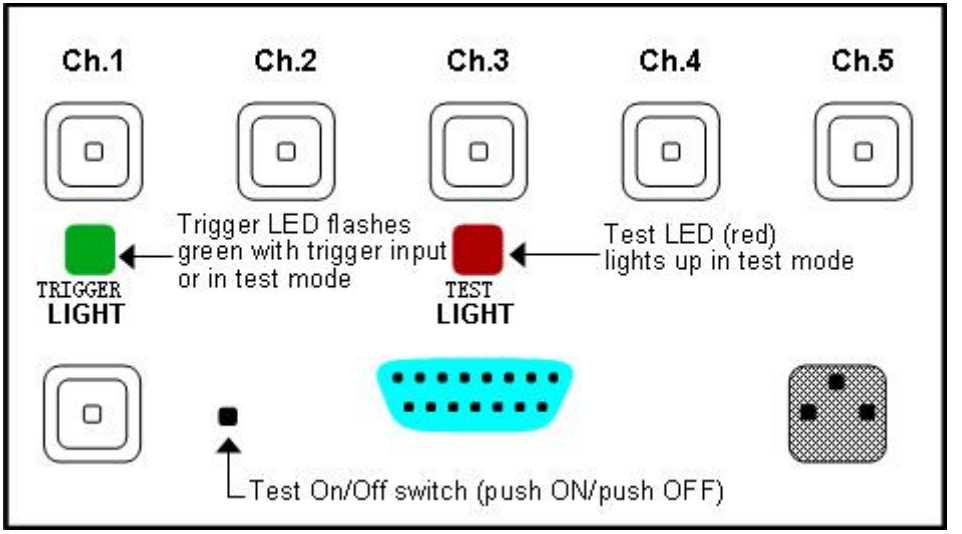


Figure F-2. Signal Interface Unit 5 diagram of functionality

The SIU5 can be connected to digital or analog boards, depending on the type of sonar you intend to use. Examples of sonars that would require a digital interface are the EdgeTech DF1000, EdgeTech ACI, Klein 2100. Examples of sonars that would require an analog interface would be Klein 595, EGG 260, Geo Acoustics, and others.

F.2 SIU4 and SIU4-2 Analog Interface

As an external module to Q-MIPS and Isis, the SIU4 provides an interface between the detected analog side-scan sonar, sub-bottom profiler, boomer, or tape-playback signal, and the Q-MIPS or Isis analog input.

F.2.1 Mechanical Description

The SIU4 output includes up to four analog signal channels with the trigger pulse superimposed on Channel 1. An adjustable attenuation of 0% to 90% can be applied to each of the four channels at the SIU4 output.

Table F-1. SIU4 and SIU4-2 specifications

Aspect of the SIU4	Specifications for the Aspect
Mechanical	• Size = 6.0 x 3.6 x 1.7 inches [156 x 91 x 44 mm] • Weight = 1 pound [454 g]
Connectors	• 4 each Channel Input on isolated BNC • 1 each Trigger Input on isolated BNC • 4 each Channel Output on isolated BNC • 2 each DC Power In/Out on 3.5 mm stereo DIN
Power	• DC plug from Isis chassis supplying ±5 VDC @ 20mA each
Trigger In	• Positive or Negative going • Duty Cycle < 40% • Pulse Magnitude > 1.1 V • 10 milliseconds > Pulse Width > 25 □s • Trigger Holdoff = 10 ms, 25 ms, or 125 ms (jumper selectable) • Blinking LED indicates Trigger Detect
Trigger Out	• Embedded in Channel 1 • Positive or Negative (internal jumper) at DC supply voltage level • Output Pulse Width = 1.0 ms • Propagation Delay (Trig In to Ch 1 Out) < 55 ms
Signal In	• Protection against inputs greater than ±6.0 V

Signal Out	• Q-MIPS Flavor: expects external 10 k load maximum output = ± 6.0 V • Isis DSP– (C31) Flavor: 10 kΩ load on SIU4 and SIU4-2 boards; they expect high impedance load • Maximum output = ± 6.0 V
Adjustments	• 4 each, rotary 10-position switch for channel attenuation, screwdriver actuated, 0 to 90% signal attenuation in 10% increments
Self-Test (SIU4-2 only)	• Switch is numbered 0-9; on switch position 9, a ramp waveform is generated for SIU4-2 and DSP testing. Refer to Figure F-1 on page 117 for SIU4-2 cabling relationships.

F.2.2 Theory of Operation

The trigger reference and up to four synchronous channels are passed through the SIU4. The trigger is detected and conditioned in the SIU4 and embedded in the Channel 1 (usually port side-scan) signal. The trigger input is AC-coupled to sense the mean voltage level of the trigger signal and shift it to 0 V. Any trigger pulse variance of 1.1 V or larger in either direction from the detected mean level will trigger a dual, monostable multivibrator. The first monostable controls the trigger holdoff, blocking any further triggers until it has timed out at 10 μs, 25 μs, or 125 μs. This holdoff feature inhibits multiple triggering from the falling edge of the input trigger, remnants of the sonar transmission cycle, and immediate acoustic returns. The second monostable sets the output trigger pulse width at 1.0 μs. A solid state switch is used to embed the 1.0 μs output trigger in the channel 1 signal. All trigger and channel inputs are diode protected to ±6.0 V.

Solid state switches are also used to connect the appropriate series attenuation resistor for each channel based on its rotary switch setting. The rotary switches are located under their respective channel output BNC. The switch positions are labeled 0 to 9 and correspond to 0% to 90% signal attenuation based on the 10 kΩ load. The DSP C31 analog card presents a high impedance (> 1 MΩ) load, so 10 kΩ load resistors are fitted on the SIU4 printed circuit board for this situation. See “2.4.4 Setting the SIU4 Signal Attenuation”.

The embedded trigger output can equal either DC power level (+5 V or -5 V) by setting jumper J1. The default is -5 V. All outputs are unprotected except in the Isis (32C) version where they are clipped at ± 2.5 V because of the input sensitivity of the Isis 32C A/D–DSP card.

Several functional attributes of the SIU4 are defined by jumper settings on the PCB. These settings are shown in Table F-2.

Setting jumpers on a SIU4 is more than just a matter of making the SIU4 operational. Different jumper settings can optimize the SIU4’s triggering to be used with a given sonar. Synchronizing the pulse rate of the trigger to the sonar’s range will enable Isis to collect the maximum amount of data during the survey.

Table F-2. Jumper settings on the PCB affecting the SIU4 and SIU4-2

Jumper Number	What It Affects	Possible Settings for This Jumper
1	Trigger Out Polarity	Open: Invalid, no trigger out 1–2: Positive (+5V) trigger out **2–3: Negative (-5V) trigger out (default)**
2	Trigger Holdoff	Open: Subbottom 125 ms **1–2: Standard 25 *ms* (default)** 2–3: Side-scan 10 ms
3-6	Output Signal Clip (Channels 1–4)	Header Not Present: Clipping not available [Default for Isis (C31)] Open: Signal not clipped [Default for Q-MIPS] Closed: Signal clipped at ± 2.5 V [Default for Isis (C32)]
7	Grounding Scheme	Pins 1 and 3 shorted: Chassis and power grounds connected **Pins 2 and 4 shorted: Signal and power grounds connected (default)** Pins 5 and 6 shorted: Signal and chassis grounds connected

Note: For all Isis defaults (shown as *italicized* entries in Table F-2), be sure to refer to your manufacturer's sonar documentation. It may be that your sonar manufacturer's recommended settings are more appropriate for your situation.

If you wish to change any of these jumpers, please contact Triton Elics Technical Support before opening your SIU4.

F.2.3 System Tests Using the SIU4-2

One of the more important functions of the SIU4-2 is to act as a first-level troubleshooting tool. Through the SIU4-2 you can isolate certain hardware actions that you might suspect aren't working properly. In turn, these isolation techniques help you determine whether you are having hardware or software problems.

After you complete your test, be sure to reset all attenuation switches back to 0. If you leave any or all attenuation switches at the high (9) setting, the recording of your images will be impaired—even to the point of making your imagery worthless for viewing!

If, for example, the imagery you may be observing during an Isis software doesn't "look right" to you, you might be having a problem with one or more I/O channels connected to Isis and the SIU4-2. As a first step in isolating the problem, you can hook up the SIU4-2 in the configuration shown in Figure F-1.

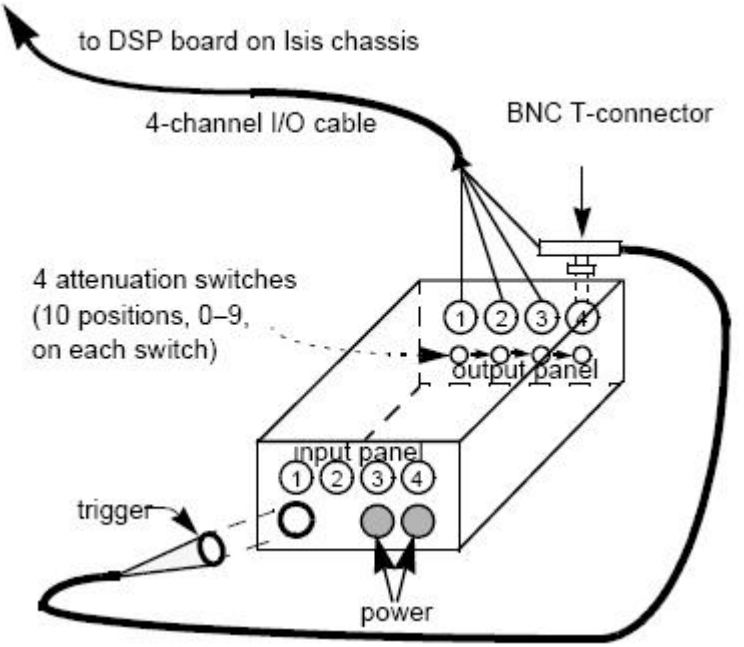


Figure F-1. SIU4-2 test setup diagram

Selecting attenuation switch position 9 on any channel of the SIU4-2 generates a ramp signal. When this signal is sent through the trigger input, the SIU4-2 generates a trigger pulse on channel 1 output. The Isis system and software needs this signal to do any recording.

To test all four channels

1. Set all four attenuation switches to 9 (the highest setting).
2. Connect the trigger and trigger cable as shown above in Figure F-1.
3. Connect the four-channel I/O cable to each of the SIU4-2 output channels and to the DSP board on the Isis chassis. Use either of the inputs on the DSP board labeled **DSP1** or **DSP2**.
4. In the Isis software, put the system in Record mode.

5. In the Isis software, you can view the waveform signal in a voltage window. (From the main menu, choose **Window→signal→Voltage**.) Figure F-2 shows an example of this kind of test where four channels were selected and tested.

Note: Observe that the left-most channel (channel 1) shows the presence of the trigger (approximately -5.0 volts). Also observe that, if this test is successful, not only will you know that the SIU is working properly, but you will also know that your PC31 (DSP) board is working, and that your WINRT virtual device driver software has been correctly installed.

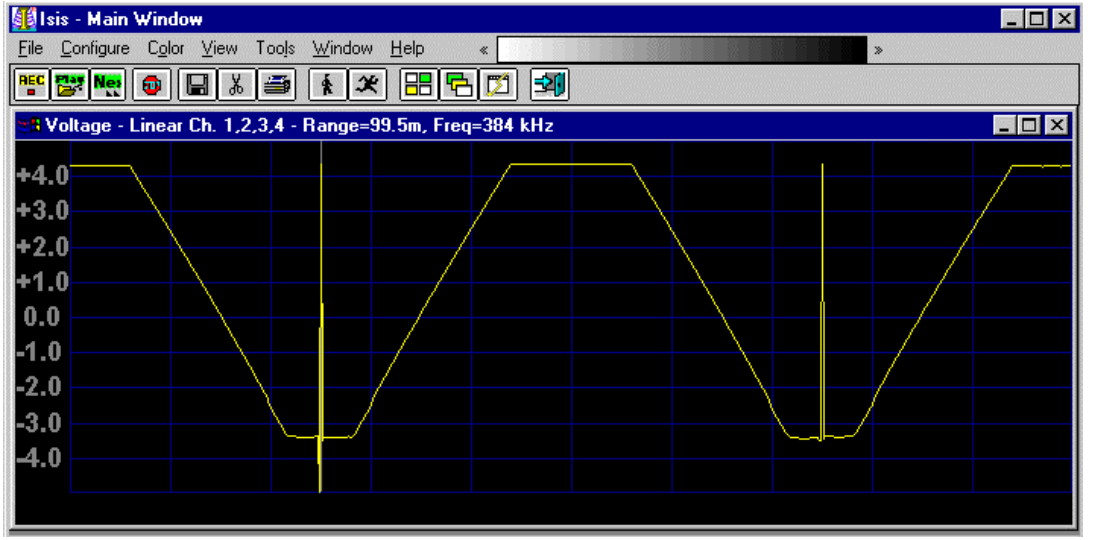


Figure F-2. Example of test ramp waveform signal with trigger present

Appendix G How Isis Processes CTD Data

Conductivity, turbidity, and density of water play an important role in determining the velocity of sound. Water's CTD can vary significantly from place to place and time to time, as can the speed of sound. This appendix describes how Isis interacts with CTD when those parameters are processed through a SeaBird or Falmouth Scientific device.

G.1 Overview

Isis reads the file ISIS.CTD when you first start Isis. ISIS.CTD contains calibration data used in computing values from CTD data. The file is ASCII and can be readily changed with any editor.
Different devices, such as SeaBird or Falmouth Scientific, require different input from the ISIS.CTD file. Consequently, you will want to tailor the contents of ISIS.CTD to match the needs of the different devices.

Instead of modifying the original isis.ctd file, it is best to copy isis.ctd to another file and then use the copy as your working ctd file. After you modify the copy, you would then copy it back onto isis.ctd so that Isis can use it when you next run the software.

For example, the file SIS7000.CTD contains the calibration coefficients for that sonar's CTD. Change the data in that file and copy SIS7000.CTD to ISIS.CTD before running Isis.

G.2 How Isis Treats SeaBird CTD Data

Data from a SeaBird CTD device is entered into Isis via the serial port. The following serial template characters relate to the various raw CTD parameters:

Q Conductivity Frequency (Hz)
{pf} Pressure Frequency (Hz) or Fish Depth (m)
b Temperature Frequency (Hz)
; Pressure Temperature (Degrees C)
| Turbidity (0 to +5 volts) (optional; use "pipe" symbol)

After Isis gets the serial port information above, the following steps are performed:

1. If a manual depth has *not* been set (in Configure, Transducer Depth), *and* both pressure frequency and pressure have been received as non-zero values, then the towfish depth (in meters) is computed. The depth computation is based on pressure frequency and pressure temperature. The result is Towfish Depth.

2. The following values are computed with the calibration coefficients read from the file ISIS.CTD:

   - Water temperature (degrees C)
   - Pressure (psia)
   - Conductivity (Siemens per meter)

Multiply Siemens per meter by 10.0 to get mmho/cm)

   - Velocity of sound in water

3. If saving data in SEG-Y format, the values are saved in the first and second channel's binary trace header as shown in the tables, where first byte in header is byte 0:

Table G-1. SeaBird's CTD SEG-Y values in first channel's binary trace header

long	ConductivityFreq	bytes 200-203	Siemens per meter *10000
long	TemperatureFreq	bytes 204-207	stored, times 10000
long	PressureFreq	bytes 208-211	stored, times 10
long	PressureTemp	bytes 212-215	stored, times 100
short	Turbidity	bytes 216-217	Turbidity sensor in volts, times 10000

Table G-2. SeaBird's CTD SEG-Y values in 2nd channel's binary trace header

long	Conductivity	bytes 200-203	Conductivity, Siemens per meter times 100000
long	Temperature	bytes 204-207	Temperature in degrees C, times 1000
long	Pressure	bytes 208-211	Pressure in psia, times 1000
long	SoundVelocity	bytes 212-215	Computed speed of sound, times 100

See the file SEGYFMT.H for more info on how Isis uses the SEG-Y data format.

4. If saving in Q-MIPS format version 1.51 or later, the values are saved as follows:

Table G-3. SeaBird's CTD SEG-Y format values saved in Q-MIPS footer record

float	Conductivity	**[Q]** computed Conductivity in Siemens per meter
float	waterTemperature	**[b]** computed Water Temperature in C
float	Pressure	**[0]** computed water pressure in psia
WORD	soundVelocity	**[v]** computed sound velocity in m/s times 30
WORD	Turbidity	**[l]** percent of light times 10000

See the file QMIPSFMT.H for the placement of these variables. Note that the raw (frequency) values from the SeaBird CTD are not saved in the Q-MIPS file format; only the computed (result) values are saved.

5. Towfish depth (computed in step 1.) is displayed in the Depth field in the Telemetry area in the Parameter Display window.
6. If the Sensors display is open, then the following information is displayed (note that these are the exact values stored on disk):

Table G-4. SeaBird's CTD values resulting when the Sensors display is active

Raw Temperature Frequency	from serial port template character '**b**'
Raw Pressure Frequency	from serial port template character '**{pf}**'
Raw Pressure Temperature	from serial port template character '**;**'
Raw Conductivity Frequency	from serial port template character '**Q**'
Raw Turbidity	from serial port template character '**|**'; use "pipe" symbol

7. The values computed in step 2 are displayed in the CTD Computed Data area of the Sensor Display window.
    - Temperature (degrees C)
    - Depth (meters) This will be the same depth as in the Parameter display window unless the depth value in the Parameter display has been overridden with a manual depth setting.
    - Sound Velocity (meters per second) computed using Chen-Millero formula
    - Conductivity (Siemens per meter)
    - Turbidity (percent of daylight)
    - In playback mode, all of the values are displayed with the following exception: If the data are saved in Q-MIPS format, only the computed values are saved. The raw frequency data are not available.

G.3 How Isis Treats Falmouth Scientific CTD Data

For Falmouth Scientific or similar devices, the following serial port template entries are used to log the following data from a CTD:

{w} Water Temperature (degrees C)
{p} Pressure (psia)
{c} Conductivity in Siemens per meter
{m} Conductivity in mmho/cm
{v} Sound Velocity
| Turbidity (0 to +5 volts) (optional; use "pipe" symbol)

After the serial port information has been received, the following steps are performed:

1. If a manual depth has *not* been set (in Configure, Transducer Depth), *and* pressure has been received, then towfish depth is computed from pressure according to the following formula:

   Depth = 0.6868 • pressure + calibration
   The calibration is set in the file **ISIS.CTD**, variable DK, which allows for zeroing-out the depth computation on deck. This is the only value used from the **ISIS.CTD** file when using a Falmouth Scientific (or any other non-SeaBird) CTD.
2. If sound velocity has *not* been received, and temperature, pressure and conductivity *have* been received, then the speed of sound in water is computed according to the Chen-Millero formula.
3. If saving data in SEG-Y format, the values are saved in the first channel's binary trace header as follows (first byte in header is byte 0):

Table G-5. Falmouth Scientific's CTD SEG-Y format values in the first channel's binary trace header (CTD raw data, where first byte in header is byte 0)

short	Turbidity	bytes 216-217	Turbidity sensor, volts times 10000

Table G-6. Falmouth Scientific's CTD SEG-Y format values in the second channel's binary trace header

long	Conductivity	bytes 200-203	Conductivity in Siemens per meter, times 100000
long	Temperature	bytes 204-207	Temperature in degrees C, times 1000
long	Pressure	bytes 208-211	Pressure in psia, times 1000
long	SoundVelocity	bytes 212-215	Computed speed of sound, times 100

See the file **SEGYFMT.H** for more info on how Isis uses the SEG-Y data format.

4. If saving in Q-MIPS format version 1.51 or later, the values are saved as follows:

Table G-7. Falmouth Scientific's CTD SEG-Y format values in Q-MIPS footer record

float	Conductivity	**[c]** computed Conductivity in Siemens per meter
float	waterTemperature	**[w]** computed Water Temperature in degrees C
float	Pressure	**[p]** computed water pressure in psia
word	soundVelocity	**[v]** computed sound velocity in m/s, stored; times 30
word	Turbidity	**[|]** ("pipe" symbol) percent of light, times 10000

See the file **QMIPSFMT.H** for the placement of these variables.

5. Towfish depth (computed in step 1) is displayed in the Depth field in the Telemetry area in the Parameter Display window.
6. The values received in step 1 and computed in step 2 are displayed in the CTD Computed Data area of the Sensor Display window.
    - Temperature (degrees C)
    - Depth (meters) will be the same depth as in the Parameter Display window unless the depth value in the Parameter Display has been overridden with a manual depth setting.
    - Sound Velocity (meters per second) is computed using Chen Millero formula.
    - Conductivity (Siemens per meter)
    - Turbidity (percent of daylight)
    - In playback mode, the same data are displayed in the Sensor Display window as in record mode.

Appendix H Using a Seatex MRU with Isis

H.1 Setting up the MRU

If you are using a Seatex Motion Reference Unit (MRU) with Isis, configure the sensor with the Seatex software. All data should be transmitted as 4-byte float values (the default). In the sensor's software, set the following parameters:
Baud Rate: **9600** or higher (although any will work)
Auto Transmit: **Asynchronous**
Interval (ms): **200** (Use **50** when collecting SeaBat bathymetry.)

H.2 Setting up Isis to Work with the MRU

From the Isis main menu, choose **File →Record Setup →Serial Ports**. Select whichever serial port(s) the MRU is connected to. Select the port ON, and press the Seatex MRU button. Verify that the baud rate matches the rate set in the MRU software. You can use the Test button in the Serial Setup dialog box to verify that the data is being transmitted from the MRU.

H.3 Saving MRU Data in Isis

It is possible to configure the MRU to transmit a wide variety of attitude and sensor data. Much of this will have no meaning in Isis. Relevant settings are shown in Table H-1.

Table H-1. Seatex MRU characteristics as used in Isis

Seatex	MRU	Isis
63	Roll	Roll angle, stored in degrees
64	Pitch	Pitch angle, stored in degrees
65	Yaw	Yaw angle, stored in degrees
68	Heading	Heading angle, stored in degrees
105	Heave	Heave, stored in meters
27	MagN	Tesla, stored as Mag-Y
28	MagE	Tesla, stored as Mag-X

29	MagD	Tesla, stored as Mag-Z
21	MagR	stored in Isis Mag-Y field
22	MagP	stored in Isis Mag-X field
23	MagY	stored in Isis Mag-Z field
160	ExtSpeed	Speed, stored in knots
162	ExtHead	Heading angle, stored in degrees (same as 68)
anything else	n/a	ignored

To view any Mag, yaw or heave measurements within Isis

Select **Window→Status and Control→Sensors**.

Figure H-1 shows a sample dialog box with MRU information in it.

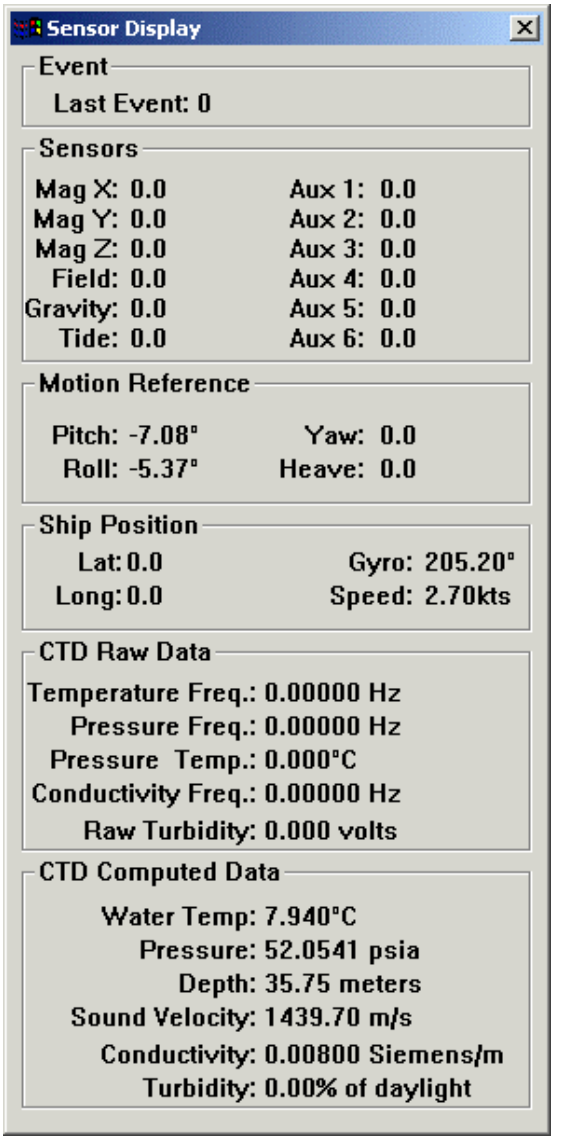


Figure H-1. The Sensor Display dialog box

The information in this box will be updated with each new sonar ping or bathymetric update.

H.4 If the MRU Has a One-Way Serial Connection

There may be instances where the serial connection from the MRU to Isis is one-way. This is necessary when a single MRU is talking to several computers simultaneously. In this case, Isis cannot transmit a “Get Digital Output Format” command to the MRU. When that happens, Isis cannot automatically configure to the data format of the MRU.

Under this condition, Isis assumes a default configuration for the MRU. This default is most commonly used for collecting attitude data in conjunction with bathymetric data processing. The MRU is assumed to be transmitting only the data shown in Table H-2.

Table H-2. Seatex-to-Isis MRUs in effect during one-way serial connections

Seatex	MRU	Isis
63	Roll	Roll angle, stored in degrees
64	Pitch	Pitch angle, stored in degrees
65	Yaw	Yaw angle, stored in degrees
105	Heave	Heave, stored in meters

Appendix I Working With Specific Sonars

Different brands and models of sonars have settings and modes of operation that are unique to them. Isis handles these differences by displaying dialog boxes that are specific to those various sonar types. From dialog boxes specific to a sonar you want to use, you choose options functions your sonar needs in order to work with Isis. This appendix documents a wide variety of side-scan and multibeam sonars that interface with Isis. Additionally, several of the sonars have server software associated with them. Server software is documented in ***Appendix J ('Server Software for Isis')*** in this manual. For general information about setting up sonars for Isis, see ***'4.1 Sonar Setup,'*** in the ***Isis User's Manual, Volume 1***.

The different makes and models of sonars have their own server file names associated with them. These choices are reflected in the general Sonar Setup dialog box (Figure 4-6 on page 70 of the ***Isis User's Manual, Volume 1***). In some cases, Isis may need to know about a control programs in order to achieve full functionality for the chosen sonar. This relationship of sonar names to server names to control programs are listed in Table I-130.

Table I-1. Sonar makes, models, server names, control programs for Isis

Sonar Maker and/or Model	serverfilename.exe	Comments and control programs, if any
Standard Analog	PC31_32.EXE	Standard Analog: Any analog sonar cabled through the SIU; no other associated control program needed
AU32 Delph Analog	ASVRSON.EXE	Delph AU32 DSP board for 2-channel Analog sidescan; no other associated control program needed
Klein 595	PC31_32.EXE	Klein 595 dual-frequency, 4-channel analog through SIU; no other associated control program needed
Klein 2000	KLEIN32.EXE	Klein digital system 2000 (dual-frequency, digital input); no other associated control program needed
Klein 3000	KLN3000.EXE	Klein 3000 - Digital Sidescan; no other associated control program needed
Klein 5000	KLN5000.EXE	Klein 5000 - Digital Multibeam Sidescan 5 beams per side; no other associated control program needed
EdgeTech 260	PC31_32.EXE	EG&G 260, 2-channel analog through SIU; no other associated control program needed
EdgeTech 272 ACI	DF1K_32.EXE	EdgeTech ACI Processor for 272-T/TD analog towfish; control program = **EGG_ACI.EXE**
EdgeTech DF1000/DCU	DF1K_32.EXE	EdgeTech DF 1000 Digital sidescan (dual-frequency, digital input; no other associated control program needed

EdgeTech DF1000/DCI	DF1K_32.EXE	EdgeTech DF 1000 Digital sidescan (dual-frequency, digital input; control program = **EGG_DCI.EXE**
EdgeTech Black Box	BlackBoxSSS.EXE	EdgeTech Black Box; control program = **EGG_DCI.EXE**
Benthos SIS-1000	CONTROLS.EXE	Benthos SIS-1000 Chirp sidescan/subbottom (mmap Server); control program = **CONTROLS.EXE**
Benthos SIS-1500	CONTROLS.EXE	Benthos SIS-1500 Chirp sidescan (mmap Server); control program = **CONTROLS.EXE**
Benthos SIS-3000	SIS3000.EXE	Benthos SIS-3000 Chirp sidescan/subbottom (mmap Server); control program = **CONTROLS.EXE**
Benthos SIS-7000	SIS7000.EXE	Benthos SIS-7000 Chirp sidescan/subbottom (mmap Server); control program = **CONTROLS.EXE**
Osiris AUV	AUVControl.EXE	Osiris AUV with EdgeTech Sidescan; no other associated control program needed
DTI Synthetic Aperture	DTI2XTF.EXE	DTI Synthetic Aperture Sonar Processor; no other associated control program needed
Deep Tow SSM	BlackBoxSSS.EXE	EdgeTech Black Box; control program = **SM2000.EXE**
Imagenex 858	PC31_32.EXE	Imagenex Model 858 Sidescan; no other associated control program needed
Generic MemMap Server	IGEN.EXE	Generic server using memory-mapped file for data transfer; no other associated control program needed

I.1 EdgeTech DF1000 Digital Sonars

If you will be using an EdgeTech DF1000/DCU or DF1000/DCI digital sonar with Isis, Isis displays screens that are unique to setting up these sonars.

To select an EdgeTech DF1000 sonar to use with Isis

1. From the Isis main menu, choose **File→Record Setup**.

   The system displays the Select Sonar dialog box.
2. In the Select Sonar dialog box, choose either:

   - **EdgeTech DF1000/DCU** or
   - **EdgeTech DF1000/DCI**

When you select either of these two sonars from the Select Sonar dialog box, Isis first displays a screen labeled **Important note about DF-1000** (Figure I-1):

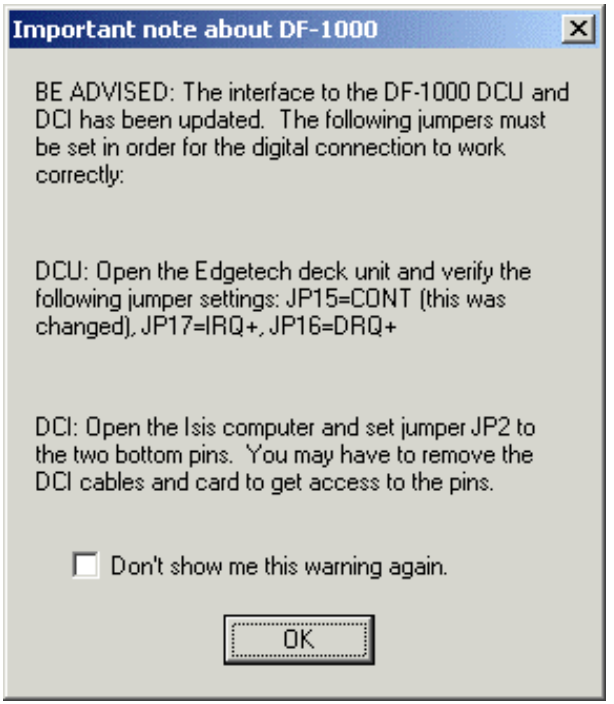

Important note about DF-1000
BE ADVISED: The interface to the DF-1000 DCU and DCI has been updated. The following jumpers must be set in order for the digital connection to work correctly:
DCU: Open the Edgetech deck unit and verify the following jumper settings: JP15=CONT (this was changed), JP17=IRQ+, JP16=DRQ+
DCI: Open the Isis computer and set jumper JP2 to the two bottom pins. You may have to remove the DCI cables and card to get access to the pins.
Don't show me this warning again.
OK

Figure I-1. Opening advisory screen about EdgeTech DF-1000 sonars

3. Observe the jumper settings that must be established for Isis to work correctly with these sonars.

Notice to Isis users with DF1000 DCU digital interface:
Starting with Isis version 4.14 the method of interfacing to this sonar changed. Version 4.14 requires some different links to be made in the EdgeTech DF1000 DCU deck unit. The message that appears in Isis versions 4.14 through 4.31 gives incorrect information on the details of these changes. The correct information is:
"Open the Edgetech deck unit and verify the following jumper settings: JP15=CONT, JP17=IRQ+, JP16=DRQ+."

4. After you click **OK** to acknowledge the message (you can also put a check mark in the **Don't show me this warning again** box before you click **OK**), Isis displays the Sidescan Sonar Information dialog box (Figure 4-3 in the ***Isis User's Manual, Volume 1***).
5. From the available fields in this dialog box, choose channels, frequencies, beam angles, beam width, etc., as you would for any other sonar; then click **OK**.

Note: If you chose the DCI version of DF-1000 (from the Select Sonar dialog box), the **Automatically start Control Program** box is already checked for you in the Sonar Information dialog box. This is the only way this sonar can operate with Isis. Isis then displays the EdgeTech DF-1000 DCI Control dialog box (Figure I-2) after you click **OK** in the Sidescan Sonar Information dialog box.

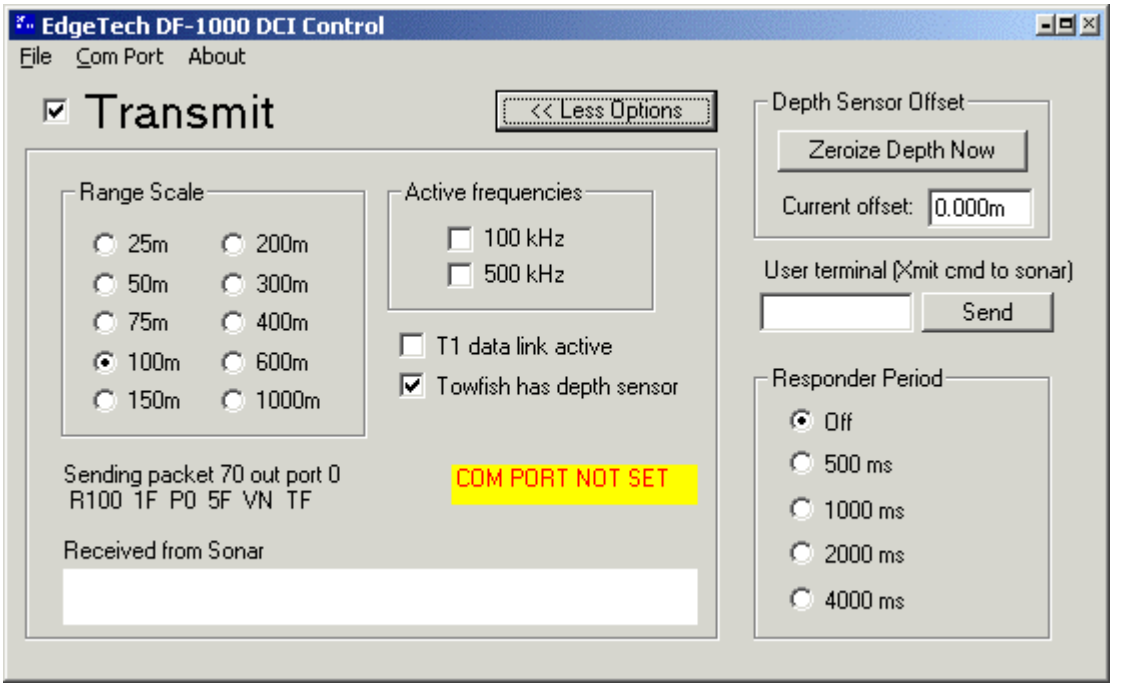


Figure I-2. EdgeTech DF-1000 DCI Control dialog box

I.1.1 Summary Description of an EdgeTech ACI Board

The current version of Isis includes support for the EdgeTech ACI board. This board has these properties:

- It's an ISA board which takes power only from the ISA bus.
- It interfaces to the EdgeTech 272 towfish.
- It allows two channels of digital data (100 kHz, 400 kHz).
- It has two internal cables:
  - serial cable (4800 baud) connecting to an Isis serial port
  - parallel cable connecting to the Isis DSP

The parallel cable passes straight-through, just like with the DCI board (which provides an interface to the EdgeTech DF1000 towfish).

The software consists of three files:

EGG_ACI.EXE Control program which communicates over the serial cable.

ACI.OUT DSP program which is loaded into the Isis DSP

DF1K_32.EXE Server program. This is the same as used for the DCI board.

When the ACI board is selected in Record Mode, the appropriate files are automatically set up.

I.1.2 EdgeTech DF1000 Usage Notes

1. The control program allows the user to select between 100 kHz and 400 kHz. The current frequency is displayed above the waterfall window in record mode. When the data are saved as XTF, the frequency is also saved and displayed on playback.
2. When **Trigger** is de-selected in the ACI board control program, the waterfall window continues to scroll in Isis (but with empty data). This is by the design of the ACI board.

J2 is the 10-pin serial header for the Isis serial connection. The cable used for this connection should be a straight-through serial cable (no null-modem required). Settings for other jumpers are shown in Table I-2.

Table I-2. ACI Board (board rev 2)

Jumpers	Settings
JP3	closed (8 MHz)
JP11	left two
JP13	left two
JP14	right two
RD-	closed
DRQ+	closed
all others	open

I.2 Klein Analog Sonar System 595

Isis can interface to the Klein System 595 analog sonar, using an SIU4. The Klein 595 cable plugs into the tape out connector on the 595 deck unit.

The Klein 595 cable pinouts (Table I-3) are unique to the model.

Table I-3. Pinouts for an SIU4-to-Klein Model 595 (tape out connector)

Channel	Position	KHz	Pin Number
1	port	100	1
2	starboard	100	2
3	port	500	3
4	starboard	500	4
5	reference out (trigger)	n/a	7
signal commons	signal commons	n/a	14–25 (all connected)
overall shield	soldered to DB-25 metal shell	n/a	n/a

I.3 Klein Digital Sonar System 2000

Isis can be interfaced to the Klein System 2000 digital sonar through the addition of two optional components. The Klein 2000 server — a software upgrade, and
A digital connection to the DSP board (either PC31 or Chico board)
The discussion below also applies to the Klein T2100 transceiver.

I.3.1 Hardware Setup

Isis connects to the Klein System 2000 by way of two cables. They are:

- **Klein 2000 Internal Cable with Select**. This is a 37-pin, female D, short ribbon cable (with bracket) going to a 40-pin IDC female header. A similar cable and connectors are available for the Chico board.
- **Klein 2000 External Cable.** This is a 37-pin, male-to-male D, round cable approximately two meters long. It is wired in a straight-through configuration.

To connect the Klein 2000 to the Isis system

1. Power off the Isis and Klein systems.
2. Remove the cover to the Isis system.
3. Seat the 37-pin end of the ***Klein 2000 with Select Internal Cable*** into a mounting bracket next to the components side of the DSP board's mounting bracket.
4. Firmly seat the 40-pin end of the ***Klein 2000 with Select Internal Cable*** into the 40-pin IDC female header on the DSP board. Look for the notation "JP15" below the header to confirm that you are attaching to the proper header.
5. Insert the short internal cable so that pin 1 (red stripe edge) coincides with the header's markings.
6. Plug either end of the ***Klein 2000 External Cable*** to the 37-pin end of the internal cable's female connector.
7. Plug the remaining end of the ***Klein 2000 External Cable*** into the Klein 2000 sonar.
8. Replace the cover to the Isis system. You can power up the Isis and Klein systems when you are ready.

Should you ever need to re-order these cables, their part numbers are:

- 44-018 Klein 2000 Internal Cable with Select
- 44-021 Klein 2000 External Cable

I.4 Klein Digital Sonar System 3000

The Klein 3000 system interfaces to Isis via a 100 Mb/s Ethernet connection. As is the case with many sonar types, a server program controls the Klein 3000 sonar. For the Klein 3000 the executable is called **K3000.EXE**. It starts automatically when Klein 3000 is selected in Isis.

I.4.1 Starting the Klein 3000 TPU

For the Klein 3000 TPU (Topside Processing Unit) to start, it needs to download a file called **Vxworks** from the Isis computer via an FTP connection. The Windows component IIS (Internet Information Services) must be installed and configured on the Isis system to enable an FTP connection. Under Windows NT 4.0 this service is called Internet Services manager. Details of the exact method of installing and configuring these services, both in Windows 2000 and Windows NT 4.0, can be found on the TEI CD-ROM in this folder:

\Information and Guides\K5000_setup\Klein5K_3K_setup.rtf

Once this setup has been completed correctly, the Klein 3000 TPU will boot from the Isis system, and Isis can be configured to work with the sonar.

I.4.2 Configuring Isis for Klein 3000

Once the Klein 3000 TPU has booted, you need to configure Isis so that it will work with the sonar.

To select the Klein 3000 sonar in Isis

1. From the Isis main menu, choose **File→Record Setup**.
2. Choose **Sonar Setup**.
3. Choose **Klein 3000**.
4. Click **OK** to each of the dialog boxes until you are back at the Isis main window.
5. Click the **Record** button in Isis.

The Klein 3000 server opens (Figure I-3):

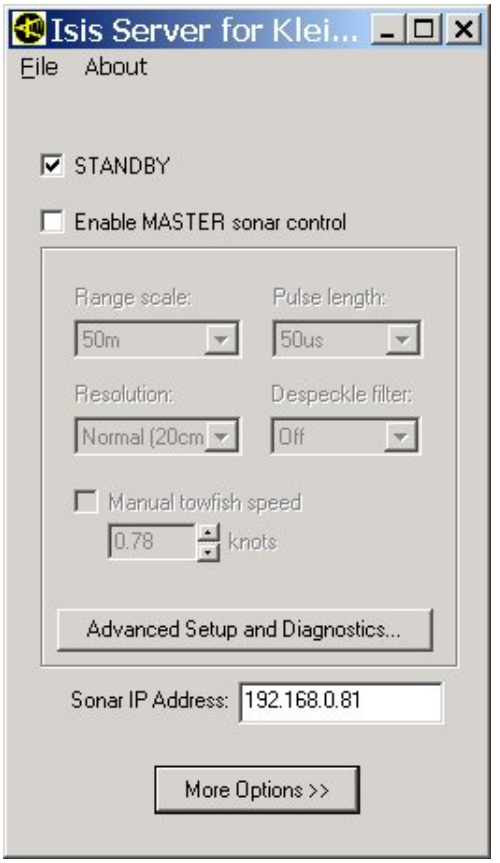


Figure I-3. Initial unexpanded Isis Server for Klein 3000 dialog box

If there is a problem connecting to the sonar, the a dialog box like that shown in Figure I-4 also displays:

Figure I-4. Typical message if Isis Klein 3000/5000 can't connect

Note: Assuming that the sonar is attached and running, the network connection and Isis computer IP address can be assumed to be good; otherwise, the sonar would have been unable to download the file **Vxworks** described previously, and would have failed to boot. The most likley cause is an incorrect server IP address. Check the label attached to the Klein TPU and make sure that the IP address set in the server (Sonar IP address) is correct.

6. Uncheck the **Standby** checkbox.

   The Isis waterfall should start scrolling, showing the Isis ping number and towfish telemetry data being updated during the scroll.

   Checking the box **Enable MASTER sonar control** enables control of the sonar so that the sonar range, pulse length, resolution and despeckle filter can be adjusted. In normal operation, the speed should come from the sonar; however, the speed can also be adjusted manually by checking the appropriate box.

Note: More than one Isis system can be connected to the sonar via an Ethernet connection, but only one system can control the sonar. Other systems are slaves and should ***NOT*** have **Enable MASTER sonar control** checked. For details about how these settings can affect the sonar data, see your Klein 3000 manual.

I.4.2.1 'More Options' in Isis Server for Klein 3000 dialog box

Clicking **More Options** in the Isis Server for Klein 3000 dialog box expands the dialog box as shown in Figure I-5.

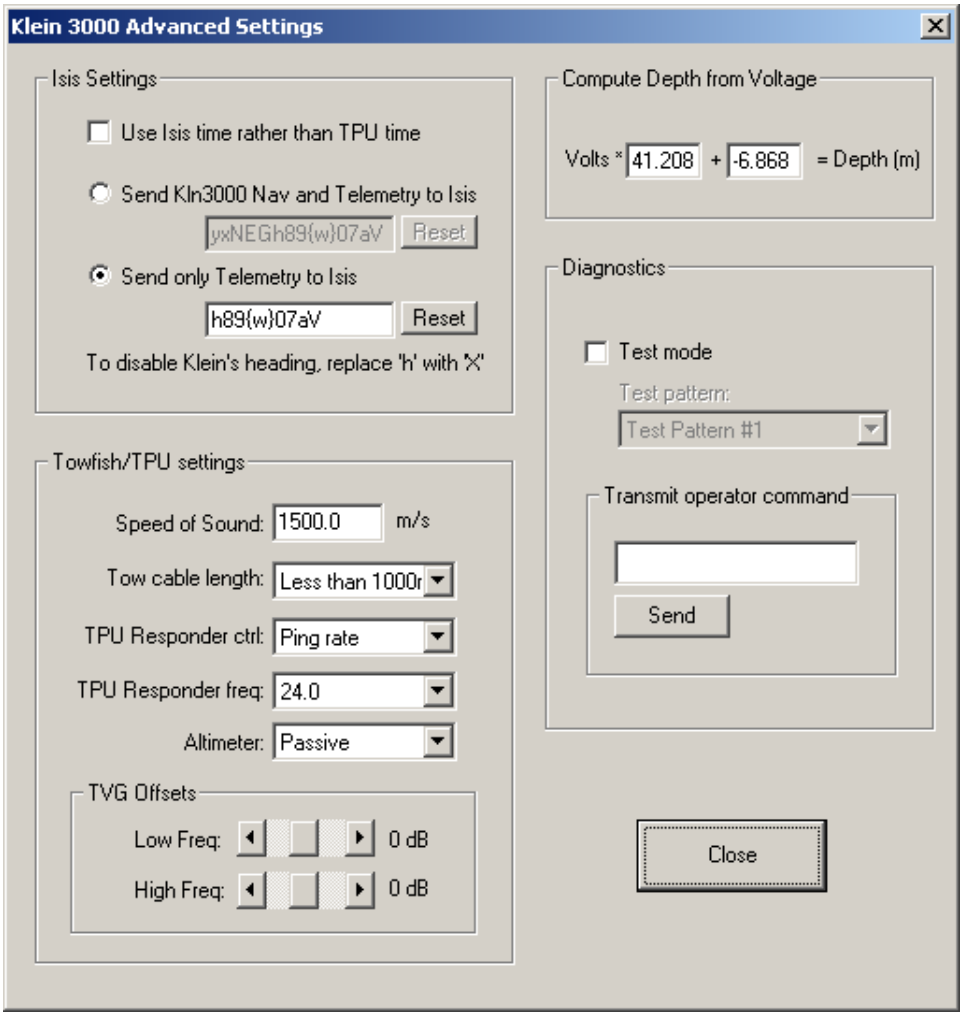


Figure I-5. Expanded 'More Options' of Isis Server for Klein 3000 dialog box

The additional panels and fields of that expanded dialog box are explained next.

Use Isis time rather than TPU time:

In some versions of the Klein TPU the time is only set once when the TPU first receives a time update from its navigation data string. Checking this option forces the sonar ping time recorded in the XTF file to be continously synchronized with the incoming time from a separate navigation string being sent to the Isis system via a serial port.

Send K3000 Nav and Telemetry to Isis:

Checking this box will send the navigation data and telemetry from the Klein 3000 system to Isis.

Send only Telemetry to Isis:

The Klein 3000 sonar requires navigation information in a particular format. If the navigation data you require in your XTF file needs to be in a different format, or if you want to reference a different position, then you can use this option to have Isis log different navigation data. For example, you may want to have the XTF file contain a position in local grid coordinates rather than Lat/Long.

A variation on the Send only Telemetry to Isis parameter is indicated by the prompt below the template field. You can, as the prompt says, disable Klein's heading by replacing '**h**' with '**X**'. You might want to do this if the heading sensor in the Klein towfish is in error (perhaps it has not been calibrated). Editing the **Send only Telemetry to Isis** template in this way will disable the heading information from the towfish heading sensor and enable you to use Isis's estimate of the towfish heading derived from navigation Course Made Good (CMG). In fact, you can disable any of the Klein telemetry or navigation data in this way. Refer to the section in the Isis manual that describes the meaning of the various navigation template tokens in Isis.

Speed of Sound:

Changes the default speed of sound used in the Klein 3000 TPU.

Tow cable Length:

Adjusts settings within the TPU for different lengths of tow cable, see the Klein 3000 manual for details.

TPU responder ctrl:

Changes the method by which the Klein system determines the navigation responder ping rate. See the Klein manual for details.

TPU responder freq:

Sets the towfish navigation responder frequency. See the Klein manual for details.

Altimeter:

Determines whether the Altimeter transduscer in the Klein towfish is **Active** (transmits and receives) or **Passive** (receives only). See the Klein manual.

TVG Offsets:

Adjusts the TVG curve in the Klein3000 towfish, see the Klein 3000 manual for details.

Compute Depth from Voltage Panel

There are two values here. The first is the conversion from Voltage to Depth (m) for the pressure sensor in the Klein towfish. The default value (41.208) is typical, but your Klein 3000 manual might have a more accurate value that you could enter here. The second value is the offset to correct from psia (absolute pressure) to psig (gauge pressure). It is the value that will force the depth reading in the Isis parameter display to be zero when the towfish is on deck. It should be around _-9.8 m and will vary with local weather conditions (average atmospheric pressure is equivalent to about 9.8 m of water).

Diagnostics Panel

Two items are located in this panel: **Test mode** and **Transmit operator command**. Refer to the Klein 3000 manual for details before using these commands.

I.5 Klein Digital Sonar System 5000

The Klein 5000 system interfaces to Isis via a 100 Mb/s Ethernet connection. As is the case with many sonar types, a server program controls the Klein 5000 sonar. For the Klein 5000 the executable is called K5000.exe. It starts automatically when Klein 5000 is selected in Isis.

I.5.1 Starting the Klein 5000 TPU

When the Klein 5000 TPU (Topside Processing Unit) starts, it first downloads a file called **Vxworks** from the Isis computer via an FTP connection. That operation allows the TPU to boot. The Windows component IIS (Internet Information Services) must be installed and configured on the Isis system to enable an FTP connection. Under Windows NT 4.0 this service is called Internet Services manager. Details of the exact method of installing and configuring these services, both in Windows 2000 and Windows NT 4.0, can be found on the TEI CD-ROM in this folder:

\Information and Guides\Klein5K_3K_setup

Once this setup has been completed correctly, the Klein 5000 TPU boot, and Isis can be configured to work with the sonar.

I.5.2 Configuring Isis for Klein 5000

After the Klein 5000 TPU has booted, you need to configure Isis so that it will work with the sonar.

To select the Klein 5000 sonar in Isis

1. From the Isis main menu, choose **File→Record Setup**.
2. Choose **Sonar Setup**.
3. Choose **Klein 5000**.

   The system displays a dialog box asking you if you will be logging bathymetry. This refers to the capability of certain Klein 5000 sonars to log interferometric bathymetry data. Unless you have one of these special sonars, answer **No** to this question.

4. Click **OK** to each of the dialog boxes until you are back at the Isis main window.
5. Click the **Record** button in Isis.

   The Isis Server for Klein 5000 dialog box (Figure I-6) opens:

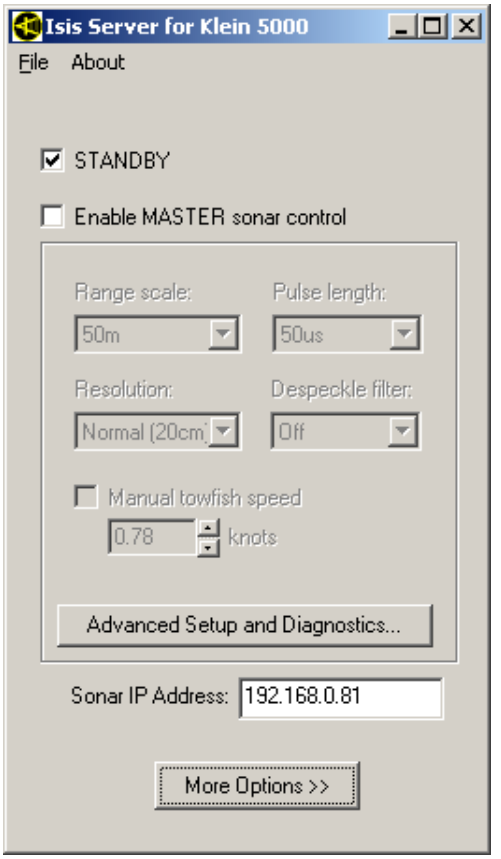


Figure I-6. Initial unexpanded Isis Server for Klein 5000 dialog box

If there is a problem connecting to the sonar, a message like that of Figure I-7 displays:

Figure I-7. Typical message if Isis Klein 3000/5000 can't connect

Note: Assuming that the sonar is attached and running, the network connection and Isis computer IP address can be assumed to be good; otherwise, the sonar would have been unable to download the file **Vxworks** described previously, and would have failed to boot. The most likely cause is an incorrect server IP address. Check the label attached to the Klein TPU and make sure that the IP address set in the server (Sonar IP address) is correct.

6. Uncheck the **Standby** checkbox.

   The Isis waterfall should start scrolling, showing the Isis ping number and towfish telemetry data being updated during the scroll.

   Checking the box **Enable MASTER sonar control** enables control of the sonar so that the sonar range, pulse length, resolution and despeckle filter can be adjusted. In normal operation, the speed should come from the sonar; however, the speed can also be adjusted manually by checking the appropriate box.

Note: More than one Isis system can be connected to the sonar via an Ethernet connection, but only one system can control the sonar. Other systems are slaves and should ***NOT*** have **Enable MASTER sonar control** checked. For details about how these settings can affect the sonar data, see your Klein 5000 manual.

I.5.2.1 'More Options' in Isis Server for Klein 5000 dialog box

Clicking **More Options** in the Isis Server for Klein 5000 dialog box expands the dialog box as shown in Figure I-8.

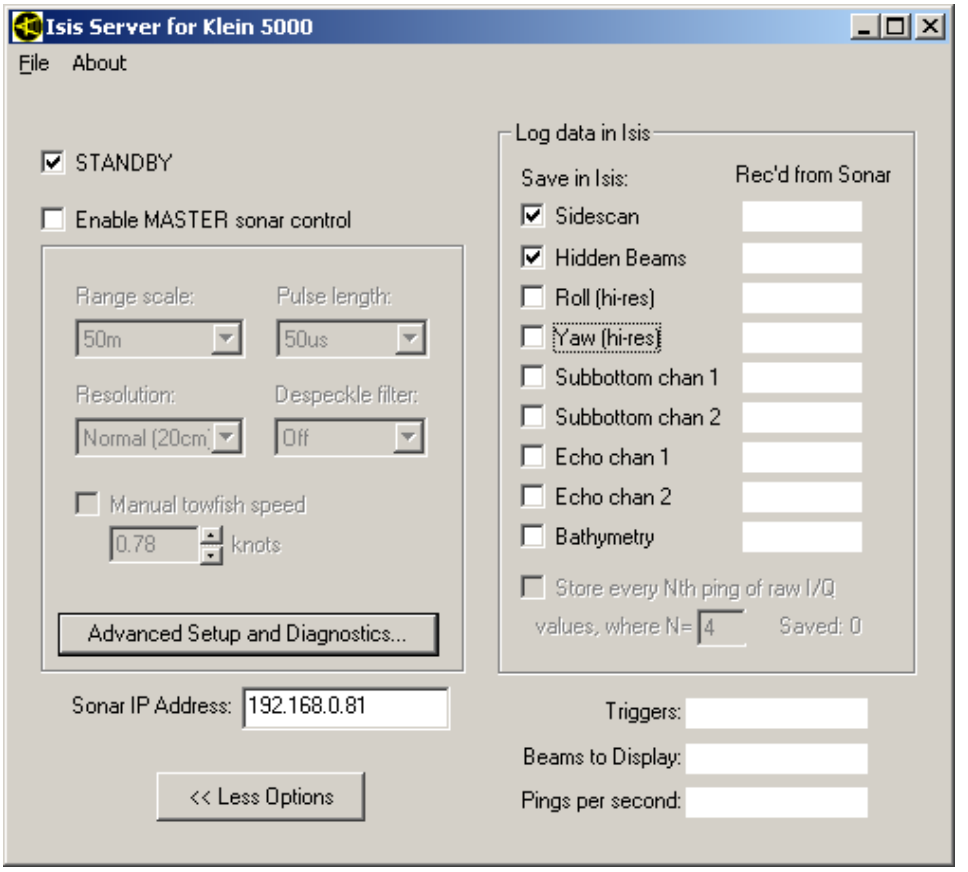


Figure I-8. Expanded 'More Options' of Isis Server for Klein 5000 dialog box

The additional panels and fields of that expanded dialog box are explained next.

I.5.2.1.1 Log Data in Isis Panel

In this area you can select which of the available data types you want to record in your XTF file. At minimum you should select **Sidescan**. The other data types are optional and will depend on the type of survey you are conducting. But note that the file size (already

quite large for this type of sonar) will obviously increase with the addition of other data types.

I.5.2.1.2 Miscellaneous Fields in 'More Options'

At the bottom of the expanded dialog box are three fields: **Triggers**, **Beams to Display**, and **Pings per second**. Each is explained next.

- **Triggers**: This field keeps a running total of the number of triggers received from the sonar.
- **Beams to Display**: The Klein 5000 sonar adjusts this number automatically depending on a number of variables, including speed, range scale and resolution. The first number indicates the number of beams currently being displayed and saved. The second number (in brackets) is the number of available beams. The maximum number for both is 5. If a combination of the above variables calls for more than 5 beams, the following message appears:

5+ Too fast! (5)

At this point, side scan data coverage along track is not optimal. Generally, it will be necessary to slow down the vessel until the message disappears. See the Klein 5000 manual for more detail on this subject.

- **Pings per second**: This field displays the current sonar ping rate. This number will increase with speed, shorter ranges, and higher resolution.

I.5.2.2 Some Guidelines for Speed, Range and Resolution

The Klein 5000 is an advanced sidescan sonar that can maintain a constant along-track resolution for a range of different vessel speeds. At the normal resolution (20 cm) setting the maximum speed is around 10 knots before along track resolution becomes less than 20 cm. At the high resolution (10 cm) setting the maximum speed is around 5 knots before the along-track resolution becomes less than 10 cm. See the Klein 5000 manual for more details.

I.5.2.3 'Advanced Setup and Diagnostics' in Server for Klein 5000

The Isis Server for Klein 5000 dialog box also has an **Advanced Setup and Diagnostics** button. Clicking it opens the Klein 5000 Advanced Settings dialog box (Figure I-9):

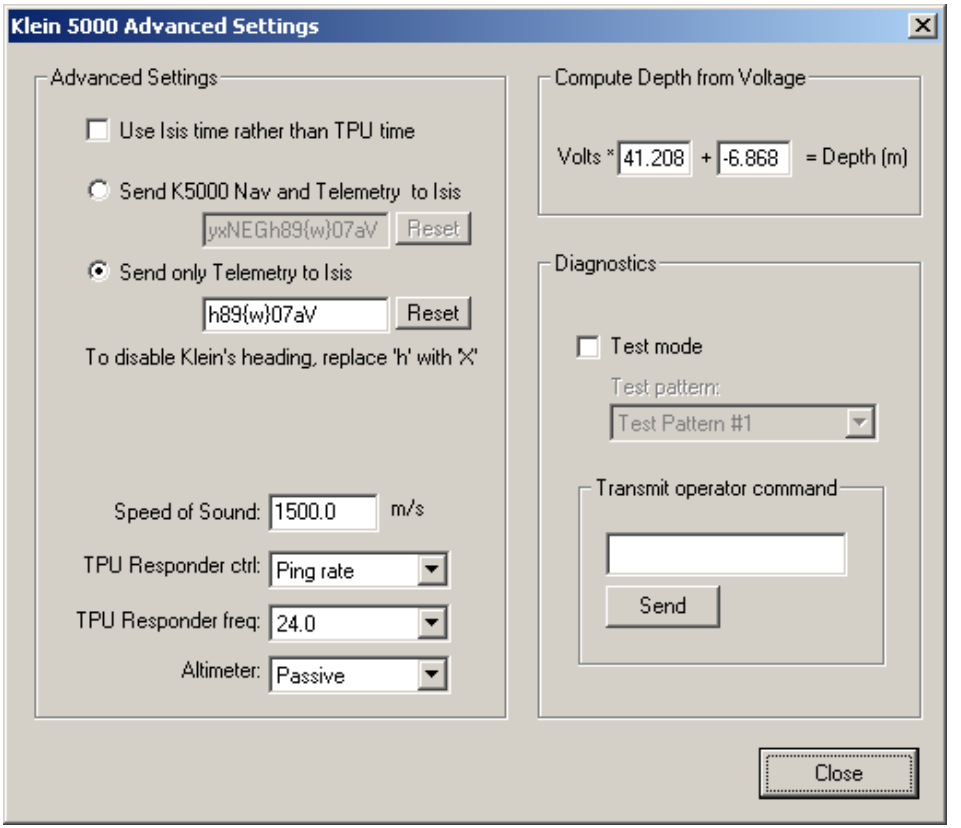


Figure I-9. Klein 5000 Advanced Settings dialog box

The items in the Klein 5000 Advanced Settings dialog box are grouped in three panels: Advanced Settings, Compute Depth from Voltage, and Diagnostics. These are explained next.

I.5.2.3.1 Advanced Settings

The Advanced Settings panel in the Klein 5000 Advanced Settings dialog box has seven parameters for you to consider:

- **Use Isis time rather than TPU time**
- **Send K5000 Nav and Telemetry to Isis**

- **Send only Telemetry to Isis**
- **Speed of Sound**
- **TPU responder ctrl**
- **TPU responder freq**
- **Altimeter**

The seven items in the Advanced Settings panel are explained next.

- **Use Isis time rather than TPU time**: In some versions of the Klein TPU the time is only set once when the TPU first receives a time update from its navigation data string. Checking this option forces the sonar ping time recorded in the XTF file to be continuously synchronized with the incoming time from a separate navigation string being sent to the Isis system via a serial port.
- **Send K5000 Nav and Telemetry to Isis**: Checking this box will send the navigation data and telemetry from the Klein 5000 system to Isis.
- **Send only Telemetry to Isis**: The Klein 5000 sonar requires navigation information in a particular format. If the navigation data you require in your XTF file needs to be in a different format, or if you want to reference a different position, then you can use this option to have Isis log different navigation data. For example, you may want to have the XTF file contain a position in local grid coordinates rather than Lat/Long.

A variation on the **Send only Telemetry to Isis** parameter is indicated by the prompt below the template field. You can, as the prompt says, disable Klein's heading by replacing **h** with **X**. You might want to do this if the heading sensor in the Klein towfish is in error (perhaps it has not been calibrated). Editing the **Send only Telemetry to Isis** template in this way will disable the heading information from the towfish heading sensor and enable you to use Isis's estimate of the towfish heading derived from navigation Course Made Good (CMG). In fact, you can disable any of the Klein telemetry or navigation data in this way. Refer to the section in the Isis manual that describes the meaning of the various navigation template tokens in Isis.

- **Speed of Sound**: Changes the default speed of sound used in the Klein 5000 TPU.
- **TPU responder ctrl**: Changes the method by which the Klein system determines the navigation responder ping rate. See the Klein manual for details.
- **TPU responder freq**: Sets the towfish navigation responder frequency. See the Klein manual for details.

- **Altimeter**: Determines whether the Altimeter transducer in the Klein towfish is Active (transmits and receives) or Passive (receives only). See the Klein manual.

I.5.2.3.2 Compute Depth from Voltage Panel

There are two values here. The first is the conversion from Voltage to Depth (m) for the pressure sensor in the Klein towfish. The default value (41.208) is typical, but your Klein 5000 manual might have a more accurate value that you could enter here. The second value is the offset to correct from psia (absolute pressure) to psig (gauge pressure). It is the value that will force the depth reading in the Isis parameter display to be zero when the towfish is on deck. It should be around -9.8 m and will vary with local weather conditions (average atmospheric pressure is equivalent to about 9.8 m of water).

I.5.2.3.3 Diagnostics Panel

Two items are located in this panel: **Test mode** and **Transmit operator command**. Refer to the Klein 5000 manual for details before using these commands.

I.6 Reson Seabat 81xx Sonar

Selecting the Seabat 81xx option from the Select Sonar menu displays the dialog box shown in Figure I-10.

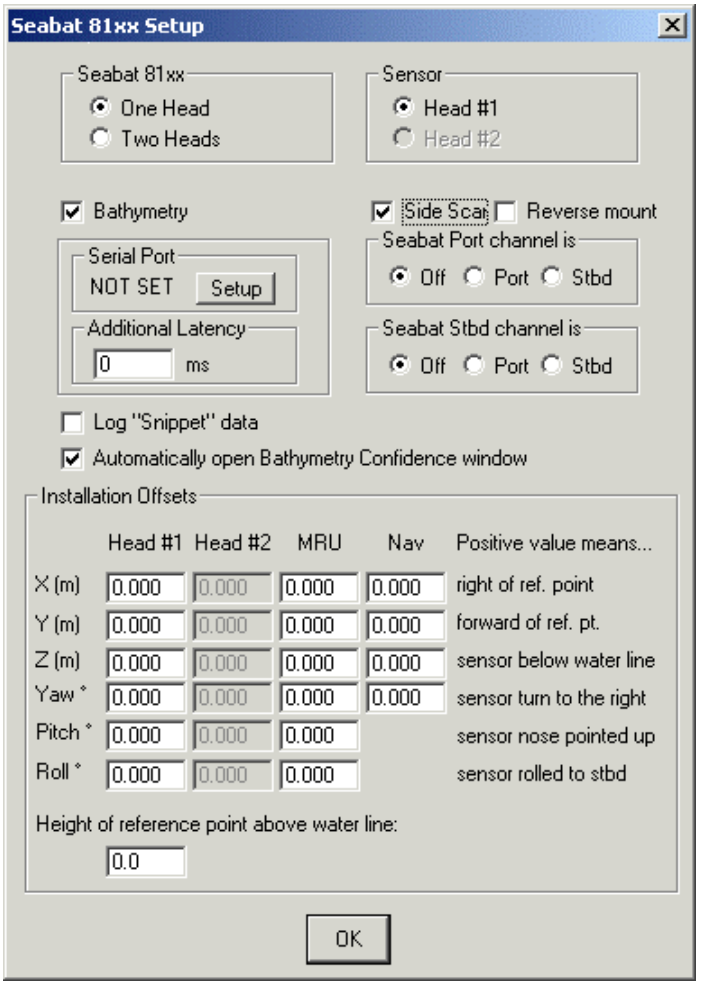


Figure I-10. SeaBat 81xx Setup dialog box

The settings in the Seabat 81xx dialog box determine whether you are collecting bathymetry and/or sidescan sonar data. Make the appropriate selection using the Bathymetry and Side Scan check boxes. If you are transferring the bathymetry data via a serial connection, use the Serial port **Setup** button to configure the port settings. You should also check **Log "snippet" data** if your sonar has this option, and you intend to transfer this data over a serial connection.

As shown in the SeaBat Setup dialog box, you can specify several parameters (Table I-4).

Table I-4. SeaBat Setup dialog box

Area or Option	Meaning and Comments
SeaBat ***One Head*** ***Two Heads***	Isis can work with either a one-head model SeaBat (such as the model 9001) or a two-head model (such as the model 9002). Choose a model.
Sensor ***Head #1*** ***Head #2***	If you have a SeaBat model 9002, you can choose Head #1 or Head #2. Head #2 is dimmed out (unselectable) if you have a model 9001. Note: Model 9001 will only output bathymetry data if the sonar is outfitted with the side-scan option 0019.
Bathymetry	Check Bathymetry if you will be creating topographic images. You can choose Bathymetry with or without also choosing **Side-Scan**; they are not mutually exclusive. When Bathymetry is enabled, you can also set up your Serial Ports. Refer to ***'Serial Port Setup'*** for setup details.
Additional Latency	If you choose Bathymetry, you can also specify Additional Latency to your Bathymetry to compensate for the lag time measured from the moment the ping is emitted until its return is logged.

Automatically open Bathymetry Confidence Window	Put a check mark in this option to enable it. When enabled, an independent, non-docked window is displayed during your recording session to quantify the water depth being reported by a beam number you specify. This gives you a way of monitoring and comparing the actual water depth as being reported simultaneously by a single-beam and multibeam sonar system. Figure I-11 shows such a window where the parameters (**Beam no.** and **Bias**) have not yet been specified. **Bias** refers to the user-specified offset of the two sonar systems.

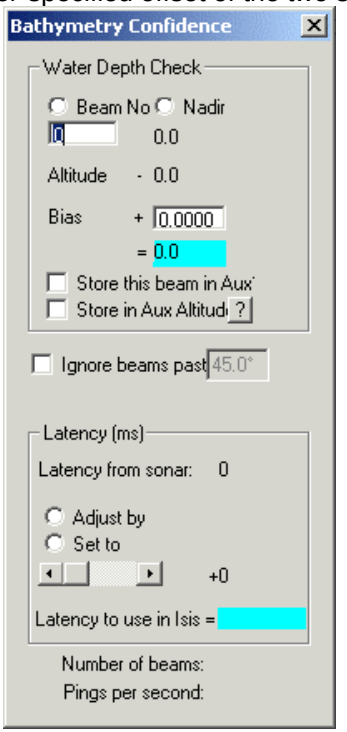


Figure I-11. Bathymetry Confidence Check window

Side-Scan	Enable **Side-Scan** if you seek to capture non-topographic imagery. You can choose **Side-Scan** with or without also choosing **Bathymetry**; they are not mutually exclusive. If you enable **Side-Scan**, you can also specify the port and starboard channels, as explained in Port/Stbd channels.
Port/Stbd channels	Prior to recording, Isis needs to know how your SeaBat is angled. The SeaBat side-scan outputs three beams, all of which are operator-selectable in side-scan mode. These beams correspond to port, center, and starboard directions as seen from the perspective of the SeaBat. You use **Side-Scan** in the SeaBat Setup dialog box to tell Isis which way(s) your SeaBat is angled — **Off**, **Port**, or **Stbd**.
Port/Stbd channels *(continued)*	*If you intend to aim your SeaBat straight down (center beam perpendicular to a flat ocean floor):* • Choose **Port** for the SeaBat Port channel and **Stbd** for the SeaBat Starboard channel. *If you intend to aim your SeaBat more to the port, (so that the starboard beam of the SeaBat now points straight down):* • Choose **Off** for the SeaBat Starboard channel (because it points in the water column) and **Port** for the SeaBat Port channel. (The SeaBat's center channel will also be represented in Isis by this setting of **Port**.) *If you intend to aim your SeaBat more to the starboard, (so that the port beam of the SeaBat now points straight down):* • Choose **Off** for the SeaBat Port channel and **Stbd** for the SeaBat Starboard channel. (The SeaBat's center channel will also be represented in Isis by this setting of **Stbd**.)

Port/Stbd channels *(continued)*	Usually you aim the SeaBat with the center beam pointing straight down. In this orientation, the port beam coincides with the ship's port side and the starboard beam coincides with the ship's starboard. The direction of each beam is unalterable with respect to the beam next to it. However, you can shift the point of aim of the set of all three beams together so that the trio points more to the port or more to the starboard. By repositioning the SeaBat on its mounting plate, you can achieve a more port-skewed or starboard-skewed aim. Angling the beams in this way may help you optimize the scan pattern for your intended data survey.
Installation Offsets	A ship usually navigates using a primary positioning system, such as GPS. Other devices on board ship use input from the positioning system as part of their own output. If the devices, such as a SeaBat or a motion reference unit (MRU), are far from the positioning system, the reported position will be different from that of the devices. In such cases, you need to let Isis know of this difference by specifying one or more numerical offsets, in meters. You make these kinds of corrections in the Installation Offsets text boxes in the SeaBat Setup dialog box.
X-axis	To compensate for ***across***-track differences, type a number in the X-axis offset box or boxes for each device affected. If the SeaBat and/or MRU is to the starboard of the positioning system, enter the across-track, positive offset (in meters) between the towfish and the positioning system. If the SeaBat or MRU is to the port of the positioning system, enter the negative offset (in meters) as the offset between the fish and the positioning system. All offsets are relative to an arbitrary reference point established by the user.
Y-axis	To compensate for ***along***-track differences, type a number in the **Y**-axis offset box or boxes for each device affected. If the SeaBat and/or MRU is forward of the positioning system, enter a positive value as the along-track positive offset (in meters) between the towfish and the positioning system. If the SeaBat or MRU is aft of the positioning system, enter the negative value as the offset between the fish and the positioning system. All offsets are relative to an arbitrary reference point established by the user.

Z-axis	The **Z** offset accounts for the difference between the reference point and the instrument (SeaBat or other multibeam head, Nav, MRU). If the multibeam instrument is mounted below the reference point (for example, deeper in the water), the Z offset value should be positive.
Yaw, Pitch, and Roll	You can have Isis compensate for a SeaBat's motion in these three dimensions by typing numerical values representing the number of degrees by which the SeaBat's attitude varies from the ship's stated course. Again, right-hand coordinate system reckoning applies. • For **Yaw**: Type negative degrees if the SeaBat is set to yaw right; enter positive degrees if the SeaBat is set to yaw left. • For **Pitch**: Type negative degrees if the SeaBat is set to pitch down; enter positive degrees if the SeaBat is set to pitch up. • For **Roll**: Type negative degrees if the SeaBat is set to roll left; enter positive degrees if the SeaBat is set to roll right. • For **Nav**: port = negative, starboard = positive; north = positive; Z = positive if reference point is below or negative if reference point is above.
Height of Reference Point above Water Line	Unless you have chosen your reference point to be at the water line, you will need to enter the appropriate offset, in meters, here.

To configure the Isis 81xx server

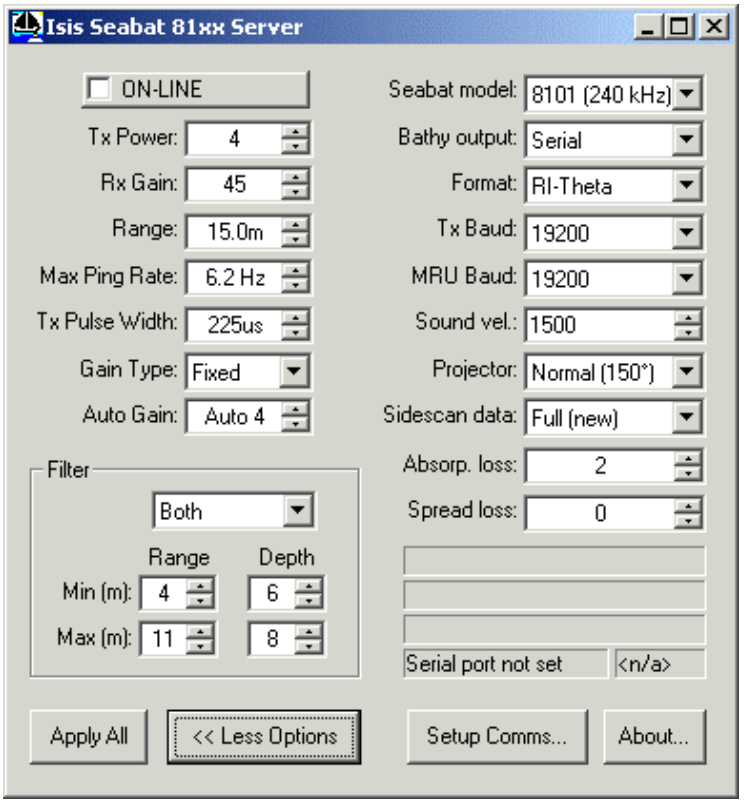


Figure I-12. Isis SeaBat 8100 Server dialog box

1. Click **Setup Comms...**

The system displays the Comms dialog box (Figure I-13).

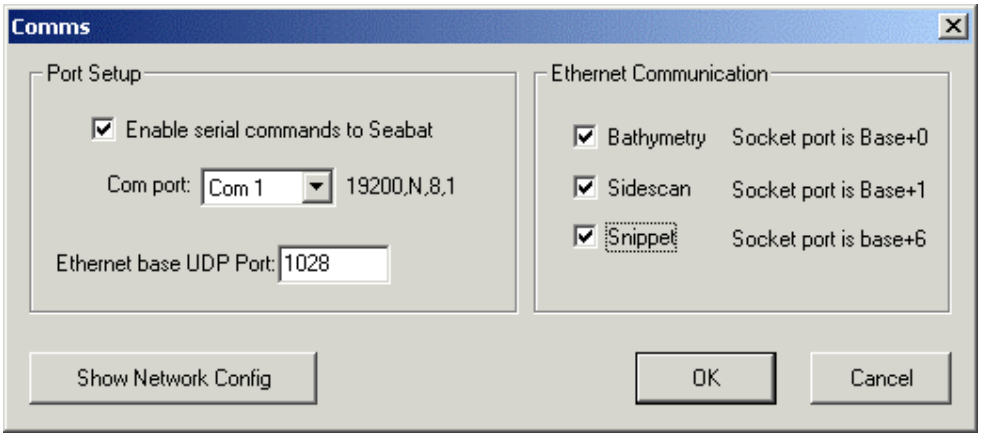


Figure I-13. Comms setup dialog for Seabat 81xx server

2. In the Comms dialog box enable any or all of the choices in the **Ethernet Communication** panel by putting a check mark next to your choice(s).
3. Click **Show Network Config** to review the current addresses for your Ethernet connection. shows an example of typical Ethernet addresses that could apply to the setup.

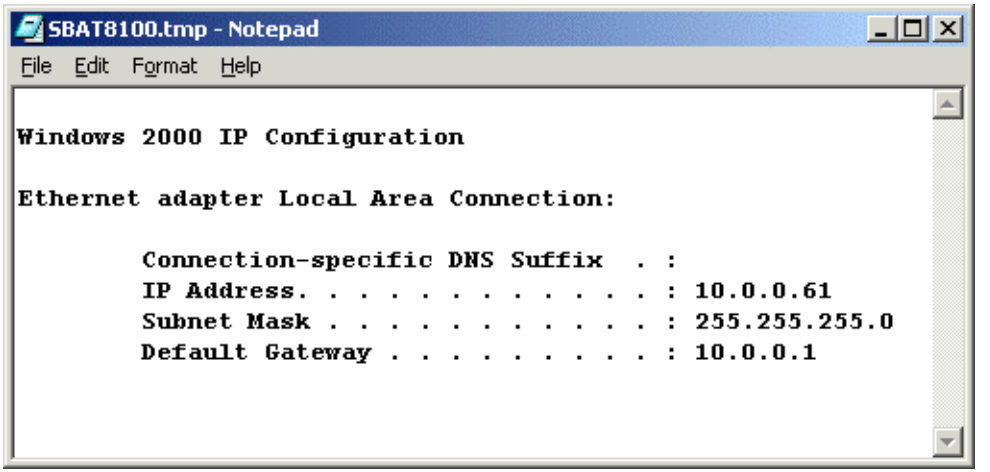

SBAT8100.tmp - Notepad
File Edit Format Help
Windows 2000 IP Configuration
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . :
IP Address. . . . . : 10.0.0.61
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 10.0.0.1

Figure I-14. Typical Ethernet addresses to be used

The numbers shown in Figure I-14 are the current TCP/IP settings for your system. They must match the settings in the Seabat topside unit, (i.e., the IP addresses must be in the same range). You may need to reconfigure either the current IP address of the Isis system or the IP address of the Seabat topside unit. In the Ethernet base UDP Port field, type a number that corresponds to the socket port your sonar uses. This is the UDP port number in TCP/IP and is set by Reson. The default value is 1028.

To set up the remote control port

1. In the Port setup area of the dialog box use the check box and drop down menu to select the ***com*** port to be used for remote control of the Seabat topside. Note that all control data is sent at 19,200 bps.
2. When all communication settings are correct, click OK to return to the main 81xx server window.

Returning to the main server window, you need to select the model of Reson sonar you are using. Make your selection from the Seabat model drop down menu at the top right and specify the type of data connection you are using for transferring the bathymetry data (**Serial** or **Network**). Recall that if you are using a serial connection, it is configured in the previous Seabat 81xx Setup dialog box.

The remaining settings in the Main Server window are simply remote versions of the local controls available from the Seabat topside. For their function consult your Reson manual.

I.7 SIMRAD 992 Sonar

This sonar interfaces to Isis as a normal analog sonar having four sonar channels and one trigger. It connects to the SIU just like any other conventional analog sonar.
Use the hardcopy connector as the output from the 992 to Isis. Do not use the analog hardcopy connector.
The **hardcopy** connector is a 25-way, D-type connector. The connections are shown in Table I-5.

Table I-5. Pin connections for a Simrad 992 analog sonar

Pin Number	Description	What it connects to
1	Ground	Ground
14	120Khz port	to SIU channel 1
2	Ground	Ground
15	120Khz port	to SIU channel 2
3	Ground	Ground
16	330Khz starboard	to SIU channel 3
4	Ground	Ground
17	330Khz starboard	to SIU channel 4
5	Ground	Ground
18	Sync (TTL)	to SIU trigger

Note: These connections are ***not*** the same as the cable that is used to connect from the **analog hardcopy**.

With respect to its operation in Isis, the Simrad 992 sonar is quite similar to the Klein 595 (described next). In fact, when configuring Isis for the Simrad 992, you can choose the Klein 595 button in the Select Sonar dialog box in Isis; Isis treats them the same.